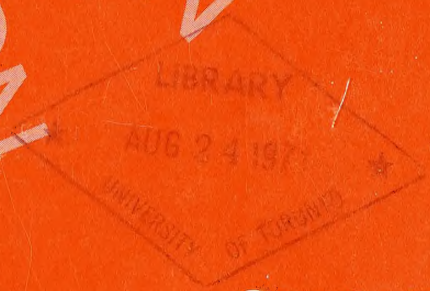


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# TELECOMMISSION



**Study 7(e)**

**Multidisciplinary Manpower Project Report**

*The Department of Communications*





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Canada

DEPARTMENT OF COMMUNICATIONS

TELECOMMISSION

*Studies*

STUDY 7 (e)

MULTIDISCIPLINARY MANPOWER STUDY

PARTICIPATING OFFICIALS OF THE DEPARTMENT

E.R. Bushfield

J. DeMercado

J. Foote

J.A. Gilbert

December 1970

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As good people's very scarce, what  
I says is, make the best of 'em.

Charles Dickens.



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## PREFACE

The complexity and scope of modern communications has created a demand for specialists in fields unheard of twenty years ago. In the Telecommission studies by the Department of Communications, it has become apparent that there is also an emerging need for persons with a deep understanding of more than one specialty. This need is felt to be most acute at the policy-making level. The President's Task Force on Communications Policy 1967 (Rostow Report Ch 9, P. 40) has expressed the problem in the United States in the following words:

"One of the underlying deficiencies of the policy framework in telecommunications is the absence of programs to develop the unusual interdisciplinary skills required for the formulation and implementation of sound public policy in a field as technologically, economically and institutionally complex as modern telecommunications.

Formulation and implementation of effective telecommunications policy, moreover, is at present seriously handicapped by a shortage of qualified personnel. Our universities have not trained engineers, systems analysts, economists or lawyers equipped to grasp the interrelationships among technological developments, systems engineering requirements, the regulatory framework and economic and social policy goals; nor are opportunities afforded for officials in policy positions to obtain such skills at mid-career levels."

The report which follows is the result of a study carried out during the summer of 1970 to determine the extent to which the problem exists in Canada. The term multidisciplinary appears to have many meanings. In this report a broad definition is used including not only those holding two or more university degrees, also those who have practical experience in two or more fields. Ideally the term would apply to those who are able to bridge the gap between the Technological and the Social Sciences. Four separate surveys were conducted covering the Telecommunications carriers, the Broadcasting Industry, Federal and Provincial Governments and the Universities.



## CONCLUSIONS

1

The following conclusions are drawn from the four reports.

More detailed conclusions may be found in the individual reports.

1. There is a primary need for Telecommunications specialists in systems.
2. There is a demand for specialists in communications engineering, regulatory matters, law, economics and the behavioral sciences.
3. There is an immediate and future need for policy-makers who are articulate in a combination of specialists.
4. These combinations will involve a mix of the hard and soft sciences (e.g. Communications Engineering and Economics)
5. Future manpower needs for specialists and policy-makers are seldom forecast more than 5 years ahead.
6. It will continue to be difficult to obtain these specialists and policy-makers.
7. There will be a variety of sources of these specialists and policy makers.
8. Graduate programmes in Communications may suffer from the lack of academic staff, graduate financial assistance and research equipment and training facilities.





PART I

CANADIAN TELECOMMUNICATIONS CARRIERS

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II Method of Approach

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## INTRODUCTION

The Report of the President's Task Force on Telecommunications Policy in the United States (the Rostow Report) revealed a need in that country for policy making executives with a multidisciplinary background. The following survey was conducted to determine the degree to which this need is evident and is being satisfied in the Canadian Telecommunications Common Carriers.

This Report is intended to provide an indication of the current situation in the Carriers and to indicate their opinions on suggested solutions to the problem.

The survey was conducted by officers of the federal Department of Communications. It was carried out as a special project related to a Telecommission Study. The organizations surveyed were those who were participating in study 7(c) "Relationship between the Department of Communications and the Telecommunications Carriers.





## I Canadian Telecommunications Carriers

### CONCLUSIONS

1. The carriers develop the competence of their present personnel through a combined program of "in-house" external or university training and, intra-organizational rotation.
2. Some carriers have maintained a continuing relationship with certain universities. There is no strong indication of a need for a more integrated approach to this process.
3. The carriers suggested that the establishment of federally funded institutes or training programs for communications policy studies in Canada is generally not desirable. An indication was given that more constructive criticism could be provided by them if these programs were more adequately defined.
4. The majority of carriers participating in the study indicated an interest in a program to facilitate the rotation of selected management people through assignments in government; business and universities. Such a program should be carefully controlled.
5. The executive in telecommunications requires a complexity of skills and multidisciplinary knowledge to adequately formulate policies in the telecommunications environment. There is a tendency to prefer individuals with multidisciplinary skills to teams of individuals from single disciplines.
6. Career planning is necessary to develop the skills required in senior management. This planning should be flexible within the rapidly changing environment and is already in practise in the organizations surveyed.



## II METHOD OF APPROACH

Organizations participating in Telecommission Study  
7 (c) were asked to expound upon the six questions in Appendix "A".

The respondents, listed in Appendix "B" submitted reports which provided the information for this report. In view of the limited number of respondents, and the high quality of the material submitted by them, this report is a collation of the various ideas expressed by the respondents.





### III RESULTS OF THE SURVEY

#### QUESTION 1

What are the basic principles and programmes being followed by the telecommunications companies in the development of skills required of senior management in policy formulation? Is there any general pattern of development?

The responses to this question were similar. All except Telesat, which is a new organization, have developed formal "in-house" executive development programs. The performance of the senior manager is periodically assessed in terms of his proven and potential managerial ability. Bell described managerial ability in terms of merged personal and corporate goalpursuance. Central to the arguments put forward by Bell and BC Telephone is the emphasis which must be placed on the corporate goal of profit making. The innovative ideas and imaginative applications of skills exhibited by advancing junior executives tend to support this goal.

Responses were concentrated around the techniques and patterns of development. Canadian National distinguished between those personnel being groomed for senior management and those in lower levels of management. The latter receive regular "total immersion" exposure to new management techniques at a retreat and receive a 50 per cent defrayment of tuition expenses. The former supplement this exposure with periodic attendance at management seminars. The accepted pattern of managerial development sees potential executives moving upward from a single functional responsibility to a multi-

functional responsibility. Formal training provided is "in-house" with occasional external training. Bell's senior managers average over 27 years of service within either Bell or the Telecommunications field.

BC Telephone suggested that the effectiveness of "in-house" training may be questionable. A small number of personnel are recruited by BC Telephone from outside sources with managerial skills. These personnel may not originate within the telecommunications field. It is contended that "although outside recruiting at senior management levels is infrequent, this melding of traditional telephone managerial methods with those from outside the carrier industry has been and is doing much to alleviate the inherent problems of "in-breeding" that can hamper objective management in a so-called specialized industry."

## QUESTION 2

Does the internal management development process involve a continuing relationship with some other institution such as a University?

Telesat and BC Telephone answered in the negative. Canadian Pacific and Bell periodically expose their potential middle and senior management to university management courses during Summer and evening sessions. A large part of the tuition fees are commonly absorbed by the firms.

Canadian National concentrates its major management development program in a four week staff training course at Bishop's University each summer. Bell Telephone's engineering department offers a post-graduate course in telecommunications at Queen's University. Bell enthusiastically endorses mid career university retraining, especially where senior management participants are able to live in the academic environment for a period of time long enough to "develop a meaningful dialogue with faculty and other managers from a variety of industries and countries". While maintaining a particularly close relationship with Dartmouth, Carleton College in Minnesota, Western Ontario, Columbia, Williams and Carnegie - Mellon, Bell on occasion contracts consultants from universities.

### QUESTION 3

How applicable is the possible establishment of federally funded Communications Policy Training Programmes or Institutes to the Canadian environment (suggested in the Rostow Report)?

BC Telephone, Canadian National, Canadian Pacific and Bell agreed that such a Programme or Institute would not be useful for the carriers in Canada. There are far fewer communications and carrier companies in Canada than in the United States, a fact which allows for a more informal, decentralized liaison between the Canadian government and the carriers. Both Canadian Pacific and Bell feel that their personnel can best achieve adequate managerial competence with a continuous and direct association with the company. Bell referred to

the Programme suggested by the Rostow Report as "cold storage" training in a "staff college" which may cost the organizations more than it would be worth. A more palatable approach would appear to be periodic seminars or conferences where an exchange of views could be encouraged. Canadian National and Canadian Pacific suggested that a Communications Training Institute for the federal government alone would be of value in view of Ottawa's increasing involvement in telecommunications policy formulation.

Telesat's views on the wisdom of formalizing government - industrial - university relations differ somewhat from those of the other four respondents. Telesat suggested that graduate courses in universities currently used by the carriers for retraining be supplemented with a multidisciplinary programme especially designed for communications organizations. The programme should last three months and be open to government, industry and the universities. It should be centrally directed and jointly financed. Courses would emphasize technology, finance, economics, law, human relations, marketing and management techniques in a general way.

#### QUESTION 4

What are the Carrier's views on participation in a programme designed to facilitate the rotation of selected management people through assignments in government, business and universities with the object of developing knowledge and experience required for major policy formulation?.

Canadian National and Canadian Pacific are not in favour of rotation.



They contend that conflicting loyalties, differing attitudes, and limited participatory service mitigate against such a scheme however attractive it may be in principle. Conferences and seminars, or perhaps a continuing consulting committee, are suggested as forums for the cross fertilization of ideas and practises between governments, industries and universities.

BC Telephone is in favour of rotation and would participate in such a scheme depending on the degree of urgency and the specific terms of reference in any agreement. Bell has already indicated its willingness in correspondence with the Public Service Commission to enter into a personnel exchange program with the federal government. Bell feels that there is merit in a rotation program as long as it involves only managerial people of high potential for no more than two-year assignments of high substantive quality.

Telesat also favors the idea of rotation. Participation would depend on the effectiveness of the administrative arrangements by which the program was governed. Any such program needs to be coordinated by a central agency - so that it is integrated into a larger multidiscipline - oriented management training program. Telesat stated "The recipient organization of the "Trainee" involved would have the responsibility of ensuring that the student would receive varied and comprehensive training in all aspects of the internal activities and management functions of the organization involved as laid out by the central agency". The emphasis here is on the words "comprehensive train-

ing" - assignments should be functionally useful and of sufficient duration to ensure their meaningful utility in the trainee's managerial development.

#### QUESTION 5

What are the carrier's views on the merits of endeavouring to develop management people with multidisciplinary skills as opposed to the concept of a team approach to specific management functions involving a world of individual, specialized skills, such as law, economics and engineering?

Managers in the telecommunications industry must deal simultaneously with the many facets of fields such as electrical engineering, economics, marketing, sales finance and law. To develop managers with multidisciplinary skills embracing more than one among such fields is not feasible according to Canadian Pacific and Canadian National. This viewpoint was however not shared by the other respondents. This is a very ambiguous area since there is a fine line between a formally multidiscipline-trained manager or departmental head and one who has developed an appreciation through operational experience. Nevertheless the question attempts to draw a distinction between policy making by single-discipline specialists operating as a multidisciplinary managerial "team" and a single, multidiscipline - trained manager. On the basis of this distinction, BC Telephone advocates an approach designed to minimize "committee" policy-making since the **latter** is too time - consuming and restrictive of individual managerial accountability. Bell is in favour of both approaches but at different levels. At the higher levels of

managerial responsibility, Bell feels that a broad multidisciplinary knowledge is needed. Telesat prefers multidisciplinary competence to be formed in individual managers because of the essentially interdisciplinary nature of the telecommunications field. Managers possessing only a compartmentalized expertise in a single discipline and lacking the necessary overlap of knowledge are ill-equipped to make complex interdisciplinary decisions.

#### QUESTION 6

What are the overall views of the carriers on directed career programs, as suggested in the Rostow Report? Could they tend to be overdone, and if so, what are their views on the most effective medium of ensuring the development of skills required in senior management?

The opinions of the carriers are rather complex on the issues involved. Telesat answered that although directed career programs could tend to become excessive, this was better than no career direction at all. All five respondents believed that directed carrier programs could tend to become overdone. Most of the carriers suggested a combination of "in-house" and "external" training development programmes along with increased government - industry - university liaisons. These areas are covered in the preceding responses. If directed career programs mean long range planning for managerial development, then this appears to be already in practise in several organizations.



#### IV COMMENTS AND OPINIONS

There appears to be basic agreement among the five carrier organizations as to the basic skills required of senior executives. The telecommunications executive is expected to possess broad multidisciplinary skills or at least a substantive appreciation of the interrelationship of disciplines in policy formulation.

Most respondents alluded to the increasing complexity of skills needed to formulate policies in the telecommunications environment whether in the public or private sector. To develop executives capable of dealing with the complexity there was agreement that the carriers must develop the competence of their present personnel through a combined program of "in-house" training, external or university training and potentially, inter-organizational rotation. The degree to which each will be included varies slightly between the five carriers surveyed.

In the development of current resources, there is little to show that a multidisciplinary background is regarded more favourably than a single discipline background. In the initial stages of individual development however, there does appear to be a strong feeling that university training must be supplemented by rigorous "in house" training or operational experience.

Where external training is required, existing programmes or courses appear to be adequate according to most but not all respond-



ents. The expansion of a continuing and functional relationship with university(s) interested in telecommunications is a recurrent suggestion. The form of these liaisons remains a subject for further discussion. The suggested communications Policy Institute or Program suggested in the Rostow Report was not sufficiently described in detail nor was its relative urgency adequately stated. It has also not been defined within a Canadian context. While the views on this were essentially negative, advocacy of greater bonds of effective communication between policy-makers in government and industry is a strong theme stressed by several carriers.

Many of the respondents indicated their awareness of the developing involvement of the Department of Communications in the telecommunications environment. There were comments that a Programme or Institute of the type suggested in the Rostow Report would be beneficial to the Department of Communications if it intends to expand its policy formation and regulatory administration roles. All the carriers surveyed **except** one seemed satisfied with the success of their present program of management development. Bilateral arrangements with universities have been concluded in the areas of retraining required. A more formal (i.e. multilateral and centralized) liaison appears to be neither imminently expected nor supported by the majority of the carriers surveyed.

While all carriers surveyed admitted the difficulties of any inter-organizational, public - private rotation scheme, the majority indicated their general willingness to participate in such a scheme

if it were tightly controlled. Knowledge of the practises and attitudes of organizations in other areas of the telecommunications environment appears to be a developing need.

The responses to the last two questions were not surprising in light of the carriers' preceding remarks. Clearly, the carriers acknowledge the need for their senior managers to be aware of the multifaceted effects of policies. The extent to which a policy-maker in telecommunications must have a knowledge of disciplines other than his own depends on the nature of the policy and the level of hierarchy at which he operates. If the policy in question is purely technical and has only remote socio-economic ramifications upon implementation, the policy maker may assess by himself the policy's results or if he is not skilled in the relevant discipline, consult a colleague who is qualified. Similarly, if the official is not near the apex of policy-making and his role is primarily advisory, once again it may be possible for him to pass the policy option elsewhere for action if he is not qualified to give broad, multidisciplinary advice.

If, however neither of these two conditions are present - that is, a policy must be made with multifaceted ramifications - either the "team" approach to policy making is employed or a multi-discipline-trained official is used. Opinions as to the relative advantages of the "team" versus the "individual" approach tend to favor the latter for reasons already mentioned. This is important to note since if the carriers consider it wise to recruit multi-discipline-trained personnel or to develop such an expertise then a

supply of such university graduates or means to develop such skills must be present. Present and future means of inculcating skills through "retraining", will have to continue to grow in magnitude and substantive quality if future managerial manpower needs are to be accommodated. Too much direction however can reduce flexibility. Career planning must then be flexible in this rapidly changing environment.

Since this report indicates qualified support for the basic tenets of the Rostow thesis it would appear necessary to delineate the specific areas or positions within the carrier industry which require multidisciplinary competence. This Report should be considered as an initial phase of data accumulation necessary to secure personnel who will influence future telecommunications policies.

The Terms of Reference

1. What are the basic principles and programs being followed by the telecommunication companies in the development of skills required of senior management in policy formulation?  
Is there any general pattern of development?
2. Does the internal management development process involve a continuing relationship with some other institution such as a university?
3. The Rostow Report to the President of the United States suggested the possible establishment of federally funded communications policy training programs or institutes in the United States. How applicable is this concept to the Canadian environment?
4. What are the carriers views on participation in a program designed to facilitate the rotation of selected management people through assignments in government, business and universities with the object of developing knowledge and experience required for major policy formulation?
5. What are the carriers views on the merits of endeavoring to develop management people with multidisciplinary skills as opposed to the concept of a team approach to specific management functions involving a world of individual, specialized skills, such as law, economics and engineering?

- 2 -

6. What are the overall views of the carriers on directed career programmes, as suggested in the Rostow Report? Could they tend to be overdone, and if so, what are your views on the most effective medium of ensuring the development of skills required in senior management?

The Respondents

\* British Columbia Telephone Company  
Canadian National Telecommunications

\* Bell Canada  
Telesat  
Canadian Pacific Telecommunications

\* These submissions reflect individual viewpoints of  
Trans-Canada Telephone System members.





PART II

REPORT ON THE MULTIDISCIPLINARY MANPOWER SURVEY

THE CANADIAN BROADCASTING INDUSTRY

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## INTRODUCTION

The Report of the President's Task Force on Telecommunications Policy in the United States (the Rostow Report) revealed a need in that country for policy-making executives with a multidisciplinary background. The following survey was conducted to determine the degree to which this need is evident in the Canadian Broadcasting Industry.

This Report is intended to provide an indication of the current and predicted situation in the Canadian Broadcasting Industry and to indicate areas where manpower research is required.

The survey was conducted by officers of the Federal Department of Communications. Twenty-two members of the broadcasting community in Canada were surveyed. These were selected after consultation with the Canadian Radio-Television Commission, as being representative of the industry as a whole. Twelve of those surveyed responded to the questionnaire and some letters were also received.



Canadian Broadcasting IndustryI CONCLUSIONS

- Demand 1. The primary need for Telecommunications specialists in the Canadian Broadcasting Industry is currently for those specializing in systems.

There is a significant demand for specialists in communications engineering, the behavioural sciences (communications) and regulatory matters.

There is a minimal demand for specialists in Sales Marketing, pure sciences, law, economics and communications arts.

2. There is an immediate and future need for policy makers who are articulate in a combination of specialties. No combination emerges as significantly more important than another.
3. The practise of Canadian Broadcasters in forecasting the needs ranges from "more than 5 years ahead" to "on an as required basis".

- Supply 1. Canadian Broadcasters feel it is now, and will continue to be, fairly difficult to obtain these telecommunications specialists and policy-makers.
2. The primary future source of telecommunications policy-makers will be present personnel retrained within the work environment.



## II METHOD OF APPROACH

The questionnaire used (Appendix "A") was in two parts. Part I Demand, consisted of these questions which were designed to assess the present and future combinations of specialized disciplinary knowledge demanded of Managers in the field of broadcasting. Part II Supply, consisted of two questions soliciting opinions on the relative urgency of and sources for recruitment.

The questionnaire was distributed to 22 **organizations** selected in consultation with the Canadian Radio-Television Commission. The actual respondents are listed in Appendix "B". Many of the respondents added informative supplementary comments many of which are included in this report.

## III QUESTIONNAIRE ANALYSIS

The responses to question 1 indicate a strong need for specialized knowledge in systems analysis. Significant needs were also shown for communications engineering, behavioral sciences (communications) and regulatory matters. The other six categories were selected by less than one third of the respondents. One additional specialty was suggested to the list, by the Canadian Broadcasting Corporation, and this was "Management sciences". There appears to be a demand for a fairly wide range of disciplines within the field of communications in the broadcasting Industry.

In the responses to question 2, a definite support for the Rostow Thesis is indicated. Eleven of the twelve respondents indicated need for policy-makers who are articulate in a combination of one or more specialities. A combination of behavioral sciences

## III

QUESTIONNAIRE ANALYSIS (Cont'd)

(communications) and communications arts was selected more than any other although it was selected by only three respondents.

A more meaningful analysis of the results of combinational choices is to note the frequency of response of each skill in any combination of two or three skills. When collated in this fashion, systems analysis is included in eight combinations; regulatory matters in five; communications engineering in five; economics in four; communications Arts in four and behavioral sciences in six. The foregoing comprise the six skill areas most in demand. Needs for multidisciplinary combinations now and in the future are identical.

There does not appear to be a consistent practice in the industry for manpower forecasting from responses to question 3. Five respondents indicated that they forecast executive manpower needs on a one-to-five year basis. Two forecast more than 5 years ahead while the remainder plan ahead one year or less.

Analysis of the responses to question 4 show that eight of twelve respondents considered the problem of recruitment to be fairly serious especially for those with expertise in systems analysis and economics when these are linked with some expertise in communications engineering and arts. Ten of the twelve respondents see this as a fairly serious problem in the future.

In question 5 the addressees were asked to choose which among four sources, will be the most important source(s) for recruitment of specialists and policy makers in broadcasting. Present personnel retrained within the organization was selected as the single most

## III

QUESTIONNAIRE ANALYSIS

(Cont'd)

important future source for recruitment of such personnel.

The two categories of present personnel temporarily assigned to a university programme for retraining and then reintroduced to the organization and recent university graduates trained in more than one discipline, who do not need further "in-house" training received five and six selection choices respectively. Four respondents felt that present personnel would be the main source for specialists and policy makers.

## IV

BEYOND THE QUESTIONNAIRE - COMMENTS AND OPINIONS

Several respondents kindly elaborated on their responses to the questionnaire. The following are comments and opinions on specific points raised.

## (a)

Systems Analysis and Design

The responses to the first question indicate an appreciation by the broadcasting industry of the importance of systems analysis and design. Mr. W. Edwin Jarman, President of Jarman Cable Systems Ltd., commented on the history leading up to this new situation. He wrote, "Initially, our approach to the analysis or design of these systems was to draw upon individuals who had somehow managed to acquire training or experience in a combination of the traditional disciplines (e.g. engineering and economics) or to create groups comprised of individuals from a variety of the traditional disciplines. In our universities, in our professional literature and in our employment of people we are increasingly recognizing a separate discipline concerned with systems planning and analysis. While it is true that our new "systems" discipline draws heavily on the traditional disciplines it would not be fair to say that it

is simply a combination of them; there is also a unique body of knowledge involved". Many broadcasters agree that systems expertise can serve as a liaison - type skill between systemically related aspects of the telecommunications environment.

(b) A Bridge between the Technological and Humanistic Disciplines

It is not surprising to find communications engineering and behavioral sciences (communications) two significantly different disciplines - being identified as equally important. Broadcasting is an industry and profession which is the clearest example of a multidisciplinary field. By its nature, engineering techniques are put to humanistic or public service uses. Mr. A.G. Day, Vice-President, Engineering of Bushnell T.V. Co. Limited, commented on the present shortage of policy makers who are trained in a combination of relevant disciplines. He stated, "A small percentage are skilled in more than one discipline, and these persons are a definite plus. There are unfortunately, only a handful who bridge the gap between the technological and highly objective, and the humanistic, and highly subjective disciplines... The gap is frequently bridged between law and technology, and between economics and technology.

The pure scientist, by his very nature, will never bridge the gap into the subjective areas. Thus the best hope, and the greatest need, is for those who fully appreciate the art of communications and who at the same time, fully appreciate the engineering, the system dimensions, and the economics related to the art."



(c) Multidisciplinary Combinations

The foregoing view is shared by the majority of the respondents but not unanimously as the following comments by Mr. Murray Chercover, President and Managing Director of CTV Television Network Ltd., will demonstrate. He wrote, "By and large, there is not, within the industry, an immediate need for policy makers who are articulate in a combination of one or more of the specialities... The multiple disciplines have not to date been in short supply. Nor.... are they likely to be in the future."

Mr. James Allard, Executive Vice-President of the Canadian Association of Broadcasters, believed there is an "immediate and urgent need" in the private entrepreneurial, legislative and regulatory arms of policy making in broadcasting" for individuals highly articulate in a combination of economics, sales/marketing and systems analysis." Mr. Allard prefaced his remarks however by stating, " ... it is entirely possible to assume a highly successful entrepreneur who is not skilled in any of the nine specific areas mentioned and does not deliberately seek knowledge in any of them but instead engages employees or professional or business advisors possessed of these skills". A similar idea was suggested by Mr. Chercover of CTV.

With regard to the future need for telecommunications policy makers in the broadcasting industry, there appears to be unanimity of opinion on the necessity to secure such personnel who are articulate in more than one relevant discipline. This indicates that there will be no return to single specialty emphasis merely because

## IV

BEYOND THE QUESTIONNAIRE - COMMENTS AND OPINIONS (Cont'd)

each skill is becoming more complex in its own right. As the technology of telecommunications becomes more complex and the science of predicting the behavioral responses of the many types of audience improves, decisions will have to be made which involve an articulate or functional appreciation of their relationships. Broadcasters have recognized this trend and hence advocate the training of appropriate personnel to systemically relate technological means and the behavioral or socioeconomic goals which they are designed to effect.

It is not surprising that sales/marketing was mentioned as an ancillary skill which will be needed by policy makers in broadcasting. Whether broadcasting is to be oriented more towards public service/educational programming or towards consumer entertainment, the public's key role in the field will have to be acknowledged by a greater concern with marketing.

(d) Training and development

No respondents believed that their present personnel could handle the complexities of policy-making in the future without some infusion of new skills by either on-the-job or academic retraining. There was a fairly even division of opinion on whether the retraining should be concentrated within the work or within the academic environment. There does appear to be a majority of broadcasters who are opposed to the recruitment of multidiscipline-trained university graduates who would not also receive additional "in-house" training in the course of their employment. Mr. Stuart McKay, President of Selkirk Holdings Limited summed up the prevailing



attitude on this point, "In-house" training... has represented one of the major blocks on which the communication industry has been built. Therefore, I would be very hesitant to recommend that a University graduate move into such a role as policy-maker or specialist without any "in-house" exposure." Mr. James Gilmore, Vice-President, Planning, of the CBC takes a slightly different point of view, "The majority of specialists are already coming more or less fully trained from university. As courses in Communications Arts in Canada become more developed, many of the specialists in the area of program production will need only minimal further training to be able to perform their functions in the CBC." This difference may be only apparent if we hypothesize that the latter view was expressed with "specialists in the area of program production" in mind, while the former view was more directly concerned with "policy-making" in a global sense.

Mr. John Bassett, Chairman and President of Baton Broadcasting Limited in Toronto stated that his organization experienced no difficulty in obtaining personnel trained for policy-making and specialized advice. He wrote, "We meet this problem (of recruitment) through on-the-job training and through an arrangement with the Kitchener-Waterloo-University, where we have set-up some scholarships which we hope will benefit us in the future with well trained and educated people".

It appears that most of the broadcasting firms intend to draw from a mixture of sources for recruitment. Mr. A.G. Day, Vice-

President, Engineering of Bushnell TV Co. Limited, was the sole respondent who assigned percentages to the mixture ingredients. He stipulated, "... All technical personnel with broad responsibilities require a minimum ten per cent, and preferably twenty, of their available time to be spent on updating in their own discipline plus research and training in allied technological fields. Technology is advancing at such a rate that a person becomes a specialist in a very narrow field only, and to have reasonable knowledge of allied disciplines, constant "in-house" and other retraining is required." Mr. Day believes that 75 per cent of all present and future specialists and policy makers will have to be retrained in some manner.

One final point is that all respondents were slightly sceptical of the probability of successfully effecting training programs - wherever their locus of emphasis lies - unless other prerequisites are present. The most important of these prerequisites to successful retraining is a personal motivation to rise the "ladder" of influence and assume an expanding number of responsibilities. Mr. Chercover of CTV cited an essential need for the policy makers' commitment to broadcasting and its philosophy. He admitted that this commitment is rare but that "it almost invariably flows from the essential nature of character of the individual, and is almost never an acquired skill stemming from academic or technological training."



APPENDIX "A"MULTIDISCIPLINARY COMMUNICATIONS MANPOWER QUESTIONNAIRE

Purpose - To assess the present and foreseeable supply of and need for highly skilled personnel trained in more than one discipline in the field of broadcasting.

INTRODUCTION:

"one of the underlying deficiencies of the policy framework in telecommunications is the absence of programs to develop the unusual interdisciplinary skills required for the formulation and implementation of sound public in a field as technologically, economically and institutionally complex as modern telecommunications.

Formulation and implementation of effective telecommunications policy, moreover, is at present seriously handicapped by a shortage of qualified personnel. Our universities have not trained engineers, systems analysts, economists or lawyers equipped to grasp the interrelationships among technological developments, systems engineering requirements, the regulatory framework and economic and social policy goals; nor are opportunities afforded for officials in policy positions to obtain such skills at mid-career levels."

(President's Task Force on Communications Policy 1967

(Rostow Report), Ch.9, P. 40)



PART I - DEMAND

1. The primary need for Telecommunications specialists is currently for those specializing in:

- ( ) 1. Communications Engineering
- ( ) 2. Systems Analysis
- ( ) 3. Sales/Marketing
- ( ) 4. Behavioural Sciences (Communications)
- ( ) 5. Pure Sciences
- ( ) 6. Law
- ( ) 7. Regulatory matters
- ( ) 8. Economics
- ( ) 9. Communications Arts
- ( ) 10. Other (Specify)

2. a) Do you think that there is an immediate need for policy makers who are articulate in a combination of one or more of the above specialties?

\_\_\_\_\_ (Yes)

\_\_\_\_\_ (No)

- b) If so, please enumerate the combination(s) for which you feel there is a need.

\_\_\_\_\_

\_\_\_\_\_

- c) Do you think that there is a future need for the same?

\_\_\_\_\_ (Yes)

\_\_\_\_\_ (No)



- d) If so, please enumerate the combination(s) for which you feel there will be a need.

\_\_\_\_\_

\_\_\_\_\_

3. For which of the following time periods are your manpower needs for the above specialists and policy makers, ascertained:

- (i) 1 year ahead \_\_\_\_\_
- (ii) 1-5 years ahead \_\_\_\_\_
- (iii) More than 5 years ahead \_\_\_\_\_
- (iv) On an ad hoc basis \_\_\_\_\_

#### PART II - SUPPLY

4. a) Do you think that the problem of obtaining these specialists and policy makers at present is:

- (i) Very difficult \_\_\_\_\_
- (ii) Fairly difficult \_\_\_\_\_
- (iii) Insignificant \_\_\_\_\_
- (iv) Not applicable \_\_\_\_\_

- b) Do you think that the problem of obtaining these specialists and policy makers in the future will be:

- (i) Very difficult \_\_\_\_\_
- (ii) Fairly difficult \_\_\_\_\_
- (iii) Insignificant \_\_\_\_\_
- (iv) Not applicable \_\_\_\_\_

5. From which of the following sources do you think the specialists and policy makers will come:

- (i) Present personnel ( )
- (ii) Present personnel retrained within your work environment ( )
- (iii) Present personnel temporarily assigned to a university programme for retraining and then reintroduced to your work environment ( )
- (iv) Recent university graduates trained in more than one discipline, who do not need further "in-house" training. ( )



QUESTIONNAIRE RELATIF A LA MAIN-D'OEUVREMULTIDISCIPLINAIRE EN COMMUNICATIONS

Objet - Evaluer la disponibilité et les besoins actuels et éventuels pour du personnel très qualifié, possédant une formation dans un éventail de disciplines reliées à la radiodiffusion.

INTRODUCTION:

"Une des carences fondamentales dans la structure des politiques en matière de télécommunications est l'absence de programmes destinés à développer les compétences interdisciplinaires sortant de l'ordinaire qui sont requises pour l'élaboration et l'implantation d'une ligne de conduite dans un domaine aussi complexe des points de vue technique, économique et institutionnel que les télécommunications modernes.

Du reste, l'élaboration et l'implantation d'une ligne de conduite efficace dans le domaine des télécommunications se voient actuellement sérieusement handicapées par une pénurie de personnel qualifié. Nos universités n'ont pas formé des ingénieurs, des analystes de systèmes, des économistes ou des avocats pouvant saisir les relations entre les développements techniques, les besoins de la technique des systèmes, la structure de la réglementation et les objectifs d'une politique économique et sociale. Les fonctionnaires qui s'occupent de l'élaboration des politiques n'ont pas l'occasion, une fois engagés dans leur carrière, de se perfectionner dans ces domaines". (President's Task Force on Communications Policy, 1967 Rapport Rostow, Ch. 9, page 40).



PARTIE I - DEMANDE

1. Le besoin d'une connaissance approfondie du domaine des télécommunications se fait surtout sentir chez les spécialistes des domaines suivants:

- ( ) 1. Technique (génie) des communications
- ( ) 2. Analyse des systèmes
- ( ) 3. Ventes/Etudes des marchés
- ( ) 4. Sciences du comportement (Communications)
- ( ) 5. Sciences pures
- ( ) 6. Droit
- ( ) 7. Questions de réglementation
- ( ) 8. Economique
- ( ) 9. Arts des communications
- ( ) 10. Autres (s.v.p. préciser)

2. a) Croyez-vous qu'il existe un besoin immédiat de gens pouvant prendre des décisions et versés dans une combinaison de deux ou de plusieurs des spécialités mentionnées ci-dessus?

\_\_\_\_\_ (Oui)

\_\_\_\_\_ (Non)

- b) Dans l'affirmative, prière d'énumérer la (les) combinaison(s) pour laquelle (lesquelles) vous pensez qu'il existe un besoin

\_\_\_\_\_

\_\_\_\_\_

- c) Pensez-vous qu'il existera un besoin éventuel pour ces mêmes combinaisons?

\_\_\_\_\_ (Oui)

\_\_\_\_\_ (Non)

- d) Dans l'affirmative, prière d'énumérer la (les) combinaison(s) pour laquelle (lesquelles) vous pensez qu'il existe un besoin

---



---

3. Pour lequel des laps de temps suivants vos besoins pour une telle main-d'oeuvre (i.e. spécialistes et gens pouvant prendre des décisions) dans les domaines susmentionnés, sont-ils déterminés?

- (i) Un an à l'avance
- (ii) 1 à 5 ans à l'avance
- (iii) Plus de 5 ans à l'avance
- (iv) Ad hoc

## PARTIE II - OFFRE

4. a) Croyez-vous que le problème du recrutement actuel de ces spécialistes et de ces gens pouvant prendre des décisions est
- (i) très difficile?
  - (ii) passablement difficile?
  - (iii) peu important?
  - (iv) inexistant?
- b) Croyez-vous que le problème du recrutement éventuel de ces spécialistes et de ces gens pouvant prendre des décisions sera
- (i) très difficile?
  - (ii) passablement difficile?
  - (iii) peu important?
  - (iv) inexistant?



5. D'où croyez-vous que ces spécialistes et ces gens pouvant prendre des décisions proviendront?

- (i) du personnel actuel ( )
- (ii) du personnel actuel recyclé au sein de votre milieu de travail ( )
- (iii) du personnel actuel qui suit des cours à l'université pour être recyclé et ensuite ramené dans votre milieu de travail ( )
- (iv) de parmi les récents diplômés d'université qui, instruits dans plus d'une discipline, n'ont pas besoin d'une formation supplémentaire en cours d'emploi. ( )



THE RESPONDENTS(a) To the Questionnaire and letters received

Mr. W.C.T. Cran,  
President, Standard Broadcasting Corporation Ltd.,  
2 St. Clair Avenue W.  
Toronto 7, Ontario.

Mr. A.G. Day, Vice-President, Engineering, Bushnell  
Communications Ltd.,  
1500 Merivale Road,  
Ottawa 4, Ontario.

Mr. J.P. Gilmore, Vice-President, Planning, Canadian Broadcasting  
Corporation,  
1500 Bronson Avenue, Room 632,  
Ottawa 2, Ontario.

Mr. W.E. Jarmain, President, Jarmain Cable Systems Limited,  
50 Piccadilly Street,  
London, Ontario.

Mr. M.T. Brown, President, CFPL Broadcasting Ltd.,  
P.O. Box 2880, Terminal "A",  
London, Ontario.

Mr. J.S. MacKay, President, Selkirk Holdings Limited,  
1000 Yonge St.,  
Toronto, Ontario.

Mr. T.J. Allard, Executive Vice-President, The Canadian Association  
of Broadcasters,  
85 Sparks Street,  
Ottawa 4, Ontario.

Mr. M.H. Chercover, President, CTV Television Network Ltd.,  
62 Charles Street E,  
Toronto, Ontario.

Mr. Allan Waters, President, CHUM Limited,  
1331 Yonge Street,  
Toronto 290, Ontario.

M. Maurice Rousseau, Ingénieur-en-Chef, Station de Radio CKVL,  
211, avenue Gordon,  
Verdun, Quebec.

(a) (Cont'd)

M. Roland Giguère, Président et Directeur général, Télé-Métropole Corporation,  
1405, rue Alexandre-Deseve,  
Montreal 133, Quebec.

Mr. S.W. Welsh, Chairman of the Board, National Cablevision Limited,  
5594 Cambie Street,  
Vancouver 15, B.C.

(b) Letters received

Mr. John Bassett, President, Baton Broadcasting Ltd.,  
Box 9,  
Toronto 375, Ontario.

Mr. F.T. Metcalf, President, MacLean-Hunter Cable TV Ltd.,  
27 Fasken Drive,  
Rexdale, Ontario.

RESULTS

The following is a summary of the information received in the completed questionnaires. As indicated in the report, the actual figures are not necessarily representative of the situation in the Canadian Broadcasting Industry. This is because of the low response to the questionnaire. Out of 22 sent out only 12 questionnaires were returned completed.

PART I - DEMANDQuestion 1

The primary need for Telecommunications specialists is currently for those specializing in:

	<u>No. of Responses</u>	1
(a) Communications Engineering	7	
(b) System Analysis	10	
(c) Sales/Marketing	3	
(d) Behavioural Sciences (Communications)	6	
(e) Pure Sciences	0	
(f) Law	3	
(g) Regulatory Matters	5	
(h) Economics	3	
(i) Communications Arts	3	
(j) Other (Management Services)	1	

1 Most respondents choose more than one specialty.

Question 2

(a) Do you think that there is an immediate need for policy-makers who are articulate in a combination of one or more of the above specialities?

YES 11

NO 1

Question 2 (Cont'd)

- (b) If so, please enumerate the combination(s) for which you feel there is a need.

- The response to this question was generally elaborated on in an attached letter. The following indicates the frequency with which each skill appeared in any combination of two or three skills:

	<u>No. of times mentioned</u>
(a) Communication Engineering	5
(b) Systems Analysis	8
(c) Sales/Marketing	3
(d) Behavioral Services (Communications)	6
(e) Pure Sciences	0
(f) Law	3
(g) Regulatory Matters	5
(h) Economics	4
(i) Communications Arts	4
(j) Other	1

- (c) Do you think that there is any future need for the same?

YES 12

NO 0

- (d) If so, please enumerate the combination(s) for which you feel there will be a need. The following indicates the frequency with which each skill appeared in any combination of two or three skills.

	<u>No. of times Mentioned</u>
(a) Communications Engineering	5
(b) Systems Analysis	8
(c) Sales/Marketing	3
(d) Behavioral Sciences (Communications)	6
(e) Pure Sciences	0
(f) Law	3
(g) Regulatory Matters	5
(h) Economics	4
(i) Communications Arts	4
(j) Other	1

Question 3

For which of the following time periods are your manpower needs for the above specialists and policy-makers ascertained:

Question 3 (Cont'd)

(i)	1 year ahead	3
(ii)	1-5 years ahead	5
(iii)	More than 5 years ahead	2
(iv)	On an <u>ad hoc</u> basis	3

Question 4

- (a) Do you think that the problem of obtaining these specialists and policy-makers at present is:

(i)	Very difficult	3
(ii)	Fairly difficult	8
(iii)	Insignificant	0
(iv)	Not applicable	0

- (b) Do you think that the problem of obtaining these specialists and policy-makers in the future will be:

(i)	Very difficult	1
(ii)	Fairly difficult	10
(iii)	Insignificant	0
(iv)	Not applicable	0

Question 5

From which of the following sources do you think the specialists and policy-makers will come?

1  
No. of Responses

(i)	Present Personnel	4
(ii)	Present personnel retrained within your work environment	8
(iii)	Present personnel temporarily assigned to a university programme for retraining and then reintroduced to your work environment	5
(iv)	Recent university graduates trained in more than one discipline, who do not need further "in-house" training.	6

1 Several respondents selected more than one alternative.





PART III

FEDERAL AND PROVINCIAL GOVERNMENTS

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Introduction

I Conclusions

II Method of Approach

III Questionnaires Analysis

IV Beyond the questionnaire - Comments and Opinions

Appendix A - The questionnaire

Appendix B - The respondents

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Appendix D - The Department of Communications' Multidisciplinary  
Manpower Needs.



## I

INTRODUCTION

The Report of the President's Task Force on Telecommunications Policy in the United States (the Rostow Report) revealed a need in that country for policy-making executives with a multidisciplinary background. The following survey was conducted to determine the degree to which this need is evident in the public sector in Canada.

The survey was conducted by officers of the federal Department of Communications. Information on the multidisciplinary manpower needs within this department was already available. For purposes of comparison this data is included as an appendix to this report.

This Report is intended to provide an indication of the current and predicted situation in the Federal and Provincial governments and to indicate areas where manpower research is required.

The survey covered a broad cross-section of organizations with varying degrees of involvement in telecommunications.



Federal and Provincial GovernmentsI CONCLUSIONS

Demand 1. The primary need for Telecommunications specialists in the government environment is currently for those specializing in systems or communications engineering.

There is a lesser demand for specialists in law, regulatory matters, economics, communications arts and the behavioural sciences.

There is a minimal demand for specialists in Experimental Science, and Sales Marketing.

2. There is an immediate need for telecommunications policy-makers who are articulate in Communications Engineering and in one other specialty in Communications. An equally important need exists for those who are articulate in Systems and another communication specialty.

The combination of specialties required are primarily those which involve a mix of the hard and soft sciences. (e.g. Communications Engineering and Economics).

3. There is some indication that future needs are for an increased proportion of policy-makers who are specialized in the Social Sciences. This should not be interpreted to mean that there is a decline in the future need for specialists in the hard sciences.
4. Future manpower needs for these specialists and policy-makers are identified from one to five years ahead by half the respondents. The other half plan on an as required basis or one year ahead.



Supply 1. Federal government respondents feel that there is now and will in the future be a serious problem in obtaining these telecommunications specialists and policy-makers. The problem is not regarded as serious by most provincial respondents.

2. The future source of telecommunications policy-makers will be new university graduates trained in more than one discipline. These graduates will then be trained further by the employing agency.

To a lesser degree, present resources will be retrained to meet the need. There is some room for new graduates in a single specialist discipline who would be trained further by the employing agency.

## II METHOD OF APPROACH

The questionnaire used (Appendix "A") was in two parts. Part I, Demand, consisted of four questions which were designed to assess the present and future combinations of specialized disciplinary knowledge demanded of policy makers in telecommunications. Part II, Supply, consisted of three questions soliciting opinions on the relative urgency of and sources for recruitment.

The objective was to include the opinions of all organizations in the Public Sector who could provide information pertinent to the survey. Letters were sent at the Deputy Minister level, requesting the name of the person to whom the questionnaire should be directed. Many organizations, particularly at the Municipal level, indicated that they could not contribute to the survey, others nominated more than one respondent. A list of the actual respondents is in Appendix "B".



### III QUESTIONNAIRE ANALYSIS

The responses to question 1 indicate a strong need for telecommunications experts with essentially technological skills. The Rostow thesis had shown an immediate need in the United States for specialists trained in both the "hard" and "soft" sciences. This thesis was not supported by the 23 respondents to this question. Choices made by the respondents continue to reflect the traditional viewpoint that telecommunications is essentially an electrical engineering field requiring primarily technological competence in a single discipline. This question was oriented only to "current" needs in single disciplines.

In the responses to questions 2 and 3 there is some definite support for the Rostow thesis. Both now and in the future there appears to be a need for multidisciplinary personnel. In question 1 the need for specialists in single disciplines in the social sciences is not apparent. The picture changes when these disciplines are examined in combination with other disciplines. The combinations containing both a "hard" and "soft" science field indicates a common belief of the importance in the future of policy makers possessing an expertise in the theory and socio-economic ramifications of communications. There is an evident trend away from an appreciation of telecommunications solely as technology towards an approach linking it with the rest of society through regulation economic and social analysis.

The majority of respondents to question 4 plan their recruitment one to five years ahead. This would appear to demonstrate an implicit acknowledgement of the rapidly changing field of telecommunications. It does however raise questions as to the data being used to make long term predictions.

Analysis of the responses to questions 5 and 6 shows that many provincial respondents do not consider the task of obtaining multidiscipline - trained specialists in telecommunications to be very difficult. The federal government on the other hand, appears to consider the problem of obtaining such specialists as serious. The reasons for this different level of concern are unclear but it is noted that those who are studying Telecommunications problems in depth tend to see this problem as being serious.

Responses to question 7 indicate a preference for multidiscipline - trained graduates who would undergo "in-house training" after starting work. Apparently, multidisciplinary training will not reduce the expected need for university graduates to supplement their academic training with occupational experience. It is probable that those respondents selecting the multidiscipline-trained graduates as a source assumed that these personnel would be educated in skills relevant to telecommunications policy formation. Graduate schools appear to be a logical source for appropriate "pre-in-house training" but do not substitute for elongated on-the-job education.

A significant minority selected "present sources retained" in responding to question 7. Once again, on-the-job training is considered

here to be the major means of modernization to meet the changing complexity of the telecommunications field. The category of present personnel temporarily reassigned to universities for retraining was however more highly rated by both federal and provincial respondents. This indicates a general belief that the graduate schools can and should play a significant role in updating skills and inculcating new ones. This would involve specialists taking courses in pursuance of a degree in or a significant awareness of a completely different discipline than the employee's field of specialization.

About 15 per cent of the respondents selected "New university graduates for single specialist disciplines" as a future source. This choice would appear to be the antithesis of the Rostow thesis. The point is, however, that it is a small percentage and consequently hardly disproves the Rostow thesis. Clearly specialists in only one discipline without a corresponding expertise in its systemic relevance are not the prominent wave for future makers of telecommunications policies. They will remain, of course, a sizeable source since some aspects of policy information will continue to demand a highly specialized competence in one skill.





## IV

BEYOND THE QUESTIONNAIRE - COMMENTS AND OPINIONS

A number of interviews were held with people who had completed the questionnaires. In addition, several respondents kindly elaborated on their responses to the questionnaire. The following are specific points that were raised more than once.

(a) The "Team" Approach

A viable alternative to developing multidisciplinary personnel is to bring together teams composed of people from various disciplines. This topic was discussed on a number of occasions. While most people acknowledged the rising importance of a multidisciplinary approach, especially for the higher levels of policy development, few foresaw the demise of the "team" approach. In the opinion of many, telecommunications involves sufficiently complex skills, to make it highly unlikely that a team of specialists would cease to be a useful guide for ultimate decisions. In fact most of those interviewed believed that university retraining in multidisciplinary matters would take place in seminars - a type of "team" approach to multidisciplinary education.

A word of warning from many was that a mere grouping together of people from various disciplines does not necessarily produce a multidisciplinary approach. There appears to be a key role developing for people who are capable of integrating these various disciplines into a true team approach.

(b) Practical VS Theoretical Knowledge

A point of interest to many were methods which could be used to develop a balance between theoretical and practical knowledge. One solution was to develop work teams for policy-making with a mixture of the two.

(c) Movement from Industry to Government

It was suggested that to develop policy-makers with a wide background in Telecommunications, it is essential to develop people with a sound knowledge of operations. This would include an infusion of people with operational experience from industry and common carriers to policy decision bodies.

(d) The Specialties

It was suggested that the supply in the specialty areas of communications engineering, systems and experimental science were currently adequate. In fact there may even be an over supply.

A "specialty" suggested which was not included in the list was "Policy Makers in Telecommunications with sufficient background and experience to understand the unique problems in the discipline and with the administrative capability to take effective action."

It was pointed out that the source of specialists is normally different from the source of policy-makers.

(e) Other Studies

The Governments of Ontario and Quebec are currently conducting studies into the future of communications which may add materially to these findings.

MULTIDISCIPLINE COMMUNICATIONS MANPOWER STUDYQUESTIONNAIRE

Purpose - To assess the present and foreseeable needs of industry and governments for multidisciplinary high skill personnel in the Telecommunications field.

INTRODUCTION:

"One of the underlying deficiencies of the policy framework in telecommunications is the absence of programs to develop the unusual interdisciplinary skills required for the formulation and implementation of sound public policy in a field as technologically, economically and institutionally complex as modern telecommunications.

Formulation and implementation of effective telecommunications policy, moreover, is at present seriously handicapped by a shortage of qualified personnel. Our universities have not trained engineers, systems analysts, economists or lawyers equipped to grasp the interrelationships among technological developments, systems engineering requirements, the regulatory framework and economic and social policy goals; nor are opportunities afforded for officials in policy positions to obtain such skills at mid-career levels."

(Rostow Report, Ch 9)

PART I - DEMAND

1. The primary need for Telecommunications specialists is currently for those specializing in:

- ☐ 1. ~~Comm~~unications Engineering
- ☐ 2. Systems
- ☐ 3. Sales/Marketing
- ☐ 4. Behavioural Science (Communications)
- ☐ 5. Experimental Science
- ☐ 6. Law
- ☐ 7. Regulatory matters
- ☐ 8. Economics
- ☐ 9. Communications Arts
- ☐ 10. Other (Specify)

2. The immediate need is for policy makers in Telecommunications who are articulate in a combination of one or more of the above specialties as follows:

(example: If you feel the combination is one of Systems and economics indicate below "2 and 8")

3. The future need is for policy makers in Telecommunications who are articulated in a combination of one or more of the specialties in (1) as follows:

(example: If you feel the combination is one of law and economics indicated below "6 and 8")

4. Our manpower needs for these specialists and policy makers are identified:

- ( ) 1. On an ad hoc basis
- ( ) 2. 1 year ahead
- ( ) 3. 1-5 years ahead
- ( ) 4. More than 5 years ahead

PART II - SUPPLY

5. We see the problem of obtaining these specialists and policy makers at present as:

- ( ) 1. Acute
- ( ) 2. Serious
- ( ) 3. Not significant
- ( ) 4. Not applicable

6. We see the problem of obtaining these specialists and policy makers in the future as:

- ( ) 1. Acute
- ( ) 2. Serious
- ( ) 3. Not significant
- ( ) 4. Not applicable

7. We see the future source of the specialists and policy makers as:

- ( ) 1. Present trained resources
- ( ) 2. Present resources retrained
- ( ) 3. New graduates from universities from specialist disciplines who we train further
- ( ) 4. New graduates from universities with multidisciplines, who we train further
- ( ) 5. New graduates from universities, with multidisciplines, who do not need further "in-house" training

- ( ) 6. Present resources temporarily assigned to a university program for retraining and then re-introduced to the work environment.



ETUDE SUR UNE MAIN-D'OEUVRE MULTIDISCIPLINAIRE EN COMMUNICATIONSQUESTIONNAIRE

Objectif -Evaluer les besoins actuels et prévisibles de l'industrie et des gouvernements en matière de personnel hautement qualifié dans les disciplines multiples du domaine des télécommunications.

INTRODUCTION:

"Une des carences fondamentales dans la structure des politiques en matière de télécommunications est l'absence de programmes destinés à développer les compétences interdisciplinaires inhabituelles qui sont requises pour l'élaboration et l'implantation d'une ligne de conduite dans un domaine aussi complexe du point de vue technique, économique et institutionnel que les télécommunications modernes.

L'élaboration et l'implantation d'une ligne de conduite efficace dans le domaine des télécommunications, du reste, est actuellement sérieusement handicapée par une pénurie de personnel qualifié. Nos universités n'ont pas formé des ingénieurs, des analystes de systèmes, des économistes ou des avocats pouvant saisir les relations entre les développements techniques, les besoins de la technique des systèmes, la structure de la réglementation et les objectifs d'une politique économique et sociale. Les occasions ne sont pas offertes, non plus, aux fonctionnaires qui occupent des postes dans le domaine de l'élaboration des politiques d'acquérir ces compétences au milieu de leur carrière."

(Rapport de Rostow, Ch 9)

PARTIE I - DEMANDE

1. Le besoin primordial de spécialistes en télécommunications se fait actuellement sentir dans les domaines suivants:
- ( ) 1. Technique (génie) des communications
  - ( ) 2. Systèmes
  - ( ) 3. Vente et étude du marché
  - ( ) 4. Science du comportement (communications)
  - ( ) 5. Science expérimentale
  - ( ) 6. Droit
  - ( ) 7. Questions de réglementation
  - ( ) 8. Economie
  - ( ) 9. Les arts des communications
  - ( ) 10. Autre (Préciser)
2. Pour élaborer des politiques dans le domaine des télécommunications, nous avons un besoin immédiat de décisionnaires qui soient versés dans une combinaison de deux ou plusieurs des spécialités susmentionnées:
- (exemple: si vous pensez que la combinaison comprend les systèmes et l'économie, indiquez ci-dessous "2 et 8")
3. Pour élaborer des politiques dans le domaine des télécommunications, nous aurons besoin dans l'avenir de décisionnaires qui soient versés dans une combinaison de deux ou de plusieurs des spécialités mentionnées en 1. ci-dessus:
- (exemple: si vous pensez que la combinaison comprend le droit et l'économie, indiquez ci-dessous "6 et 8")

4. Nos besoins en ce qui a trait à ces spécialistes et à ces décisionnaires sont déterminés

- ☐ 1. Sur une base ad hoc
- ☐ 2. Un an à l'avance
- ☐ 3. Un à cinq ans à l'avance
- ☐ 4. Plus de 5 ans à l'avance

## PARTIE II - RECRUTEMENT

5. Nous considérons le problème du recrutement actuel de ces spécialistes et de ces décisionnaires comme étant:

- ☐ 1. Aigu
- ☐ 2. Sérieux
- ☐ 3. Insignifiant
- ☐ 4. Ne s'applique pas

6. Nous considérons le problème du recrutement futur de ces spécialistes et de ces décisionnaires comme étant:

- ☐ 1. Aigu
- ☐ 2. Sérieux
- ☐ 3. Insignifiant
- ☐ 4. Ne s'applique pas

7. Nous considérons la source future de spécialistes et de décisionnaires comme étant:

- ☐ 1. Le personnel actuel déjà formé
- ☐ 2. Le personnel actuel recyclé
- ☐ 3. De nouveaux diplômés d'université que nous formerons davantage dans certains domaines spécialisés.

- ( ) 4. De nouveaux diplômés d'université que nous formerons davantage dans des disciplines polyvalentes.
- ( ) 5. De nouveaux diplômés d'université en disciplines multiples qui n'ont pas besoin de formation supplémentaire en cours d'emploi
- ( ) 6. Personnel actuel suivant temporairement des cours à l'université en vue d'un recyclage et ramené par la suite dans le milieu du travail.

APPENDIX "B"THE RESPONDENTS(A) Federal

M. Claude Gauthier, directeur adjoint et secrétaire  
Le Conseil des Arts du Canada

Mr. R.H. Snidal, Director General, Manpower Policy Development  
and Review, Department of National Defence

Mr. D.W.R. McKinley, Vice-President (Laboratories), National  
Research Council of Canada

Mr. C.F. Hobbs, Director General, Planning and Systems,  
Post Office Department

Dr. A.D. Boyd, Science Advisor, Science Council of Canada

Mr. H.J. Williamson, Director, Telecommunications and Electronics  
Branch, Department of Transport

Mr. F.L. Bentley, Chief, Applied Research and Development, Telecom.  
and Electronics Branch, Department of Transport

Mr. J.R. Donaldson, Supervisor, Commercial Leased Services,  
Telecom. and Electronics Branch, Department  
of Transport

Mr. J.R. McKay, Chief, Design and Construction, Telecom. and  
Electronics Branch, Department of Transport

Mr. E.F. Porter, Chief, Maintenance and Operations, Telecom.  
and Electronics Branch, Department of Transport

(B) Provinces

Mr. J.B. Baird, Director of Data Processing and Research, Office  
of the Prime Minister, Victoria, B.C.

Mr. A.E. Webb, Deputy Minister, Department of Public Works,  
Government of British Columbia

Mr. W. Knight, Management Salaries Supervisor, Alberta Government  
Telephones

Mr. H.E. Phillips, Director, Personnel, Dept. of Development,  
Prince Edward Island

- 2 -

Mr. D. Taylor, Systems Analyst, Department of Development,  
Prince Edward Island

Mr. W.B. White, Assistant Deputy Provincial Treasurer,  
Prince Edward Island

Mr. G.I. Bocian, Planner, Provincial Planning Office,  
St. Johns, Nfld.

Iain N. Jackson, Planner, Provincial Planning Office,  
St. Johns, Nfld.

Mr. D.I. Towers, Project Co-ordinator, Communications Study  
Team, Management Services Division, Treasury  
Board Secretariat, Government of Ontario

M. J.R. Tennet, ingénieur-en-chef, Ministère des Communications  
Gouvernement du Québec

M. J. Guèvremont, directeur général des communications  
gouvernementales, Gouvernement du Québec

M. Jean Simon, conseiller technique, Ministère des Communications,  
Gouvernement du Québec

Mr. S.M. Hodgson, Commissioner, Government of the Northwest  
Territories

RESULTS

The following is a summary of the information received in the completed questionnaires. As indicated in the report, the actual figures are not necessarily representative of the total communications picture in Canada. This is because the respondents have interests in different areas of Communications. In addition the numbers involved are not large enough to be significant statistically. The figures do however provide an indication of the opinions of those specialists in various government agencies engaged in communications.

TOTAL NUMBER OF RESPONDENTS	Federal	10
	Provincial	<u>13</u>
	Total	23

PART 1 - DEMANDQUESTION 1

The primary need for Telecommunication specialists is currently for those specializing in:

	<u>NO. OF RESPONSES</u> <sup>1</sup>		
	<u>FED.</u> <sup>2</sup>	<u>PROV.</u>	<u>TOTAL</u>
(a) Communications Engineering	6	7	13
(b) Systems	9	5	14
(c) Sales/Marketing	1	0	1
(d) Behavioural Science (Communications)	2	1	
(e) Experimental Science	0	0	0
(f) Law	2	1	3
(g) Regulatory Matters	3	2	5
(h) Economics	3	3	6
(i) Communications Arts	3	1	4
(j) Other (specify)	2(Common sense Electronics)	1(Operations)	3

<sup>1</sup> Several respondents checked more than one.

<sup>2</sup> Federal Department of Communications figures not included.



QUESTION 2

The immediate need is for policy makers in Telecommunications who are articulate in a combination of one or more of the specialties in Question 1. (Letter combinations correspond to the letters used in question 1).

TABLE 1

Combination	<u>No. of Responses</u>		
	Fed. <sup>1</sup>	Prov. <sup>2</sup>	TOTAL
a + b	2	2	4
a + b + d	-	1	1
a + b + h	1	-	1
a + h	-	1	1
a + i	-	2	2
b + d	-	1	1
b + d + h	1	-	1
b + f	2	-	2
b + f + d	-	1	1
b + g	1	-	1
b + g + h	1	-	1
b + h	1	3	4
b + i	-	2	2
d + g	1	-	1
f + g + h	-	1	1
h + i	1	-	1

TABLE 2

Specialty	<u>Frequency of Occurrence in Response</u>		
	Fed.	Prov.	TOTAL
a	3	6	9
b	10	10	20
c	-	-	-
d	2	3	5
e	-	-	-
f	2	2	4
g	3	1	4
h	5	5	10
i	1	4	5
j	-	-	-

1 One respondent did not answer

Two respondents provided 2 alternatives

2 One respondent provided 2 alternatives

QUESTION 3

The future need is for policy makers in Telecommunications who are articulate in a combination of one or more of the specialties in Question 1. (Letter combinations correspond to the letters used in question 1).

TABLE 1

Combination	<u>No. of Responses</u>		
	Fed. <sup>1</sup>	Prov. <sup>2</sup>	TOTAL
a + b	1	2	3
a + b + d	-	1	1
a + b + e	1	-	1
a + b + h	-	2	2
a + c + g	1	-	1
a + d	-	1	1
a + h	-	2	2
a + i	-	1	1
b + d	-	1	1
b + d + h	2	-	2
b + h	-	1	1
b + g	1	-	1
d + h	-	1	1
d + h + i	-	1	1
d + i	1	-	1
f + h	-	1	1
h + i	1	-	1
i	-	1	1

TABLE 2

Specialty	<u>Frequency of Occurrence in Responses</u>		
	Fed.	Prov.	TOTAL
a	3	9	12
b	5	7	12
c	1	-	1
d	3	5	8
e	1	-	1
f	-	1	1
g	2	-	2
h	3	8	11
i	2	3	5
j	-	-	-

1 Two respondents did not answer

2 Two respondents provided two alternatives

QUESTION 4

Manpower Needs for these specialists and policy makers are identified.

CHOICE	FED. <sup>1</sup>	PROV. <sup>1,2</sup>	TOTAL
On an ad hoc basis	3	4	7
1 year ahead	1	3	4
1-5 years ahead	5	6	11
More than 5 years ahead	-	-	-

1 One respondent did not answer

2 One respondent provided 2 alternatives

PART 11 - SUPPLYQUESTION 5

We see the problem of obtaining these specialists and policy makers at present as:

CHOICE	FED.	PROV.	TOTAL
1. Acute	1	3	4
2. Serious	9	6	15
3. Not significant	-	2	2
4. Not applicable	-	2	2

QUESTION 6

We see the problem of obtaining specialists and policy makers in the future as:

CHOICE	FED.	PROV.	TOTAL
1. Acute	-	1	1
2. Serious	9	7	16
3. Not significant	1	2	3
4. Not applicable	-	3	3

QUESTION 7

We see the future sources of these specialists and policy makers as:

CHOICE	FED. <sup>1</sup>	PROV. <sup>1</sup>	TOTAL
1. Present trained resources	1	3	4
2. Present resources retrained	2	5	7
3. New graduates from universities from specialist disciplines who we train further	5	2	7
4. New graduates from universities with multidisciplines, who we train further	8	6	14
5. New graduates from universities with multidisciplines, who do not need further "in-house" training -	-	-	-
6. Present resources temporarily assigned to a university program for retraining and then re-introduced to the work environment	5	5	10

<sup>1</sup> Some respondents provided several alternatives









PART IV

CANADIAN UNIVERSITIES

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I Conclusions

II Method of Approach

III Questionnaire Analysis - Comments and opinions

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Appendix B - The Questionnaire Science/Engineering Departments.

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Appendix E - Communications Dissertations.



## Introduction

The Report of the President's Task Force on Telecommunications Policy in the United States (the Rostow Report) revealed a need in that country for policy-making executives with a multidisciplinary background. The following survey was conducted to determine the extent to which the need in Canada will be met by Canadian Universities. It was designed to determine the scope of multidisciplinary training, related to communications, being carried out in the universities. In addition, communications dissertations or research was sought as well as a summary of communication oriented programmes in both Electrical Engineering and the Social Sciences.

To determine the relative importance of communications programmes the respondents (Appendix "A") were asked for their opinions on the future of communications. A statistical breakdown of their financial resources being applied to communications programmes was also solicited.

The survey was conducted by officers of the federal Department of Communications. It included all graduate schools in Canadian Universities.



Canadian UniversitiesI CONCLUSIONS

1. Graduate programmes in Communications sponsored by Engineering departments may suffer from the lack of academic staff, graduate financial assistance and research equipment and training facilities.  
  
A more definite lack of academic staff, graduate financial assistance and research equipment and training facilities is found in communications programmes sponsored by departments in the Social Sciences and Humanities.
2. There is general agreement that graduate students in Engineering and Applied Sciences, who are interested in Communications, should be allowed to take courses in other disciplines. Economics appears to be favoured as both a mandatory and optional choice.
3. There is general agreement that graduate students in the Social Sciences and Humanities, who are interested in Communications, should be allowed to take courses in other disciplines. Computer Science and Systems Design or Analysis are most favoured although on an optional basis.
4. The complexity of multidisciplinary programmes present serious difficulties of initiation and administration for any university.
5. There is a fairly urgent need for multidiscipline-trained graduates.
6. There is an awareness of the growing role of the universities in communications training. A considerable variety of opinion exists as to Canada's major areas of interest in Communications and to those fields which are neglected.

## II METHOD OF APPROACH

Two questionnaires were used, one for the Science/Engineering departments (Appendix B) and one for Social Science/Humanities departments (Appendix "C"). The wording was synchronized for the two questionnaires - differing only in questions 4 and 5 dealing with the kinds of disciplinary mixes to be recommended by respondents for their multidisciplinary programmes in Communications.

Since summer is naturally a vacation period in most universities, it was anticipated that a less than complete response ratio would be achieved. Nevertheless it was felt that those universities with an interest in research and training in Communications would respond.

To obtain an institutionally broad response from each university both questionnaires were addressed to the Deans of the Graduate Schools. It was suggested that the Dean's office integrate the various departmental offerings in Communications with the university-wide regulations covering multidisciplinary programmes. It was anticipated that the Dean's office would contact any Departmental spokesman likely to have knowledge or an interest in Communications. Within the Social Sciences and Humanities, these would likely include Linguistics, Sociology, Political Science, Psychology, Anthropology and Management Science. Among the Professional Schools, it was anticipated that interest would be demonstrated in the Faculty of Law. Within the pure or Applied Sciences, it was anticipated that the respective heads of Electrical Engineering and Computer Science would be contacted by the Graduate School respondent.

A useable return of approximately 50 percent was realized. A higher percentage actually returned the questionnaires, but the information supplied was incomplete. The specific questions on the merits and future of multidisciplinary training were answered by most respondents and provided valuable data for this report. Question concerning communications courses were in general poorly answered and have been supplemented by reference to university calendars. Since multidisciplinary programmes in Communications are a relatively new phenomenon, calendar information tends to be limited.

A number of interviews were held with members of the faculties at Queens, McGill, Montreal, Toronto, Ottawa, Carleton, British Columbia and Simon Fraser Universities. These personal contacts allowed for a more complete understanding of the various problems encountered by the Universities in completing questionnaires such as ours. In addition, verbal amplification of problems in the scope and direction of Communications programmes proved to be invaluable for a survey which must owe some of its assessment to personal impressions.

It was initially hoped that it would be possible to persuade several of the larger universities to join with the Department in quantitatively assessing the multidisciplinary backgrounds of each graduate student from the transcript of his academic record. However this proved to be too large a task for the universities to handle during the summer. In most cases, graduate and undergraduate records were not integrated in Graduate School files for each graduating class. This made it difficult to extract anything but a very small sample. Also the sanctity of student records from public analyses (barring individual consent) was a problem for a few universities.



One university did analyze their records for all graduating students in 1970. This analysis showed conclusively that there are virtually no students at the graduate level taking advantage of the opportunity to take courses in a discipline outside of their graduate specialty. There was a fair degree of multidisciplinary work at the undergraduate level, but often this was simply the situation of students satisfying the course requirements rather than any attempt to broaden their scope.

### III QUESTIONNAIRE ANALYSIS - COMMENTS AND OPINIONS

#### (a) Current Programmes and Courses

An analysis of the first four questions of the questionnaire shows a very limited emphasis on communications as a distinct discipline. The majority of respondents reported no graduate program in communications. There are however a number of courses being offered in other faculties which relate to communications. These are listed in Appendix "D".

Responses to the question on dissertation topics showed a similar lack of emphasis on communications. There appears to be a general appreciation however that this is an area of great potential. Appendix "E" provides some examples of current topics.

Because of the lack of current programmes the data received on the number of students enrolled in courses is quite inconclusive. Many universities declined to answer this particular question.

#### (b) Multidisciplinary Programmes - Engineering Viewpoint

Respondents were asked for their opinion on the merits and dimensions of multidisciplinary graduate programmes in Communications.

All twenty-two respondents to the Engineering questionnaire were in favour of allowing graduate students in Engineering and the Applied Sciences, who are at the same time interested in Communications, to take courses in disciplines other than those in Engineering and the Applied Sciences. The addressees were asked to select which courses listed in a table of subjects in the Social Sciences/Humanities/Liberal Arts Professions should be made mandatory or optional choices in a

multidisciplinary programme in Communications. Economics was most favoured as both a mandatory and optional choice. Languages and the Behavioral Sciences were selected next most often followed by Public Administration and Law in respective order. Of the liberal professions Medicine and Architecture were selected by several respondents as optional possibilities. Most respondents indicated that such choices should be optional. From several interviews held it would appear that this indication is due to a lack of clear definition of what the composition of a multidisciplinary programme in Communications should be.

A great variety of opinions were received on major problems which would be faced if such a multidisciplinary programme in communications were to be located in the Department of Engineering. Problems most often mentioned by the twenty-one respondents included shortages of qualified staff (Manitoba, Moncton, Sir George Williams, Victoria, Windsor) and programme funding (Laval, Manitoba, Sask. (Regina), Sir George Williams, Victoria, Dalhousie). Other problems less often suggested were the difficulties of devising an integrated multidisciplinary programme avoiding both shallowness and unnecessary rigour, (Laurentian, Ottawa, RMC, Windsor), the inertia of traditional pedagogical specialization (McGill, Carleton, Nova Scotia Tech., Trent) and a shortage of interested students capable of completing such a programme (Lakehead, Queen's, McMaster, W. Ont.).

Opinions of the Engineering respondents on the relative urgency, or lack thereof, for a multidiscipline-trained graduate in communications were varied. While seventeen of twenty respondents think there is a need for the multidiscipline-trained graduate in the field of Communications, only ten felt the need to be urgent. Five believe the need is not urgent and four "wrote in" their opinion that the need is more in between these two extremes. Nineteen respondents felt that the multidiscipline-trained graduate can "meaningfully contribute to" academic life, private industry, and the federal and provincial governments. The fact that seventy per cent of the Engineering respondents feel that there is at least a fairly urgent need for a multidiscipline-trained graduate, is significant in light of the almost total absence of programmes in Communications which could appropriately train such a graduate in two or three years of integrated study.

(c) Multidisciplinary Programmes - Social Sciences and Humanities Viewpoint.

Twenty-two of the Social Science and Humanities respondents gave opinions on the merits and dimensions of multidisciplinary graduate programmes in communications. Twenty-one favoured allowing graduate students in the Social Sciences/Humanities/Liberal Arts Professions, and who are at the same time interested in Communications, to take courses in disciplines such as Electrical Engineering, Computer Science, Mathematics and Systems Design. Once again the emphasis was placed on the optionality of course offerings in any multidisciplinary programme

in Communications. Disciplines selected most often to be incorporated in either a mandatory or optional manner into a multidisciplinary programme were Computer Science, Systems Design, Mathematics and Electrical Engineering, in that order.

The problems envisaged by these respondents do not differ radically from those mentioned by the Engineering respondents; that is shortage of qualified staff (Manitoba, Moncton, Ottawa, Windsor), and financial resources (Manitoba, Saskatchewan (Regina), Sir George Williams, Victoria, Laval), excessive departmental specialization and autonomy (Guelph, Manitoba, Saskatchewan (Regina), Waterloo Lutheran) and the difficulties of devising an appropriate programme (UBC, W. Ontario, Windsor). No respondent mentioned as a problem the lack of student interest in a multidiscipline Communications programme.

Only one Professional school submitted comments on the questionnaire. It's relevance is such that it is worthwhile to quote directly from the submission of Professor Hugh Lawford of Queen's Faculty of Law. He wrote: "A major problem of enrollment of graduates in Law in a multidisciplinary graduate programme in communications would be the question of the nature of the degree which would be obtained. Since a high portion of the law graduates pursuing advanced studies intend to teach in law schools, the graduate degree obtained in the interdisciplinary programme would have to be generally recognized by Canadian Law Schools. Canadian Law schools have developed such a high degree of specialization that one could expect many graduates to find positions requiring only qualifications in communications. Of course, a Law graduate pursuing the degree of Master of Laws at Queen's University could concentrate on legal problems of communications.



Indeed, the Queen's Law Faculty is already offering a course on the regulation of the communications industry, a course on intellectual and industrial property rights, and a number of courses in administrative law ...."

Nineteen of the twenty-one respondents to question (6) on the social Sciences/Humanities questionnaire felt that there is a need for the multidiscipline-trained graduate in the field of communications. This is approximately the same number as in the Engineering questionnaire. Fourteen of twenty-four believed the need to be urgent - sixty-eight percent of the respondents. Twenty of twenty-two believed that the multidiscipline-trained graduate can meaningfully contribute to academic life, private industry, and the federal and provincial governments. Two respondents believed such a graduate could not meaningfully contribute to academic life.

(d) Present Communications Programme Inadequacies

The respondents were asked "Is your graduate programme in Communications limited at present by inadequacies of any of the following factors?": (a) academic staff, (b) graduate financial assistance, (c) research equipment and training facilities, (d) motivated programme direction and (e) other.

Of the twelve Engineering respondents more than half felt their Department possessed large inadequacies in these areas. Five respondents of the twelve felt their inadequacies were large in the area of motivated programme direction. It is important to note

however the very substantial number of respondents who felt inadequacies were either "small" or "none". Several respondents indicated specific "other" inadequacies. Carleton's Donald George, Dean of Engineering, underscored the lack of sufficiently capable students to effectively participate in its communications programme; Laval's Joseph Risi, mentioned the paucity of multidisciplinary emphasis as a significant inadequacy. It seems clear that one of the two pressing inadequacies lies in the quantity and quality of academic staff to direct a Communications programme - especially if the programme is to be multidisciplinary in character. There also appears to be a scarcity of funds to support graduate students in Electrical Engineering. Funds available for the purchase and upkeep of research equipment and training facilities appear to be more plentiful although no figures were quoted.

The nine responses received on the Social Sciences/Humanities questionnaire indicate a slightly clearer pattern of financial deprivation. Two-thirds of the respondents stated that there are inadequacies in each of the areas. Apparently spokesmen for the graduate programmes in Communications within the Departments in the Social Science and Humanities believe there is a large financial burden placed upon the support of staff, students and equipment/facilities. Like the Engineering respondents, a majority of the respondents from the Social Science and Humanities rated any inadequacies in the area of motivated programme direction to be either small or nonexistent. Queen's Hugh Thorburn, Head of the Political



Science Department, suggested that its chief inadequacy is the lack of a precisely stated programme outline illustrating its needs. His colleague, Hugh Lawford in the Faculty of Law mentioned the lack of adequate liaison among professors in various parts of the university offering courses or conducting research related to communications.

(e) Future of Communications in Canada

Opinions were solicited on which are the major areas of Canada's interest in Communications. The Engineering respondents mentioned public education by telecommunications (Lakehead, Manitoba, Western Ont., Windsor), satellite communications systems (Sask. (Regina), Windsor, Sir George Williams, New Brunswick, Queen's) and Canadian-based computer development (Carleton, Sir George Williams). In addition to the preceeding, the Social Science and Humanities respondents selected Post Office reform (UBC, Queen's) and date retrieval from the confines of information systems (Manitoba, Ottawa, Montreal).

The major fields of communications felt to be neglected in Canada were identified. Respondents to the Social Sciences and Humanities questionnaire suggested such areas as multidiscipline-trained telecommunications personnel (Manitoba, Moncton, Sask. (Regina)), management informations systems - their design and regulation of data upkeep and usage of specialized stored data (Ottawa, Manitoba, Victoria) and Television improvements especially in bicultural programming (Queens, Royal Military College, UBC, Sir George Williams). The Engineering

respondents mentioned in addition to the preceding, others such as the development of Northern Canadian communications systems (UBC, Waterloo), public education by telecommunications (Royal Military College, Manitoba, Victoria) and the development of multiservice telecommunications systems in general (Ottawa, Queens, Sask. (Regina) Waterloo).

A common theme represented in many of the stated opinions is the need to become more systemically aware of the relationships between technological improvements and the socio-economic milieu in Canada. Some University respondents such as those from Saskatchewan (Regina) and Waterloo believed that cost-benefit analysis applied to various telecommunications policy proposals must be made known to the public. Resource and financial restraints should not necessarily foreclose innovations but neither must they be kept in the background. Clearly, it is felt that the socio-economic utility of technological innovations in the telecommunications sphere must assume the guiding force of persuasion behind policy formation.

Another theme observed is the spirit of growing national pride in distinctive Canadianism. There appears to be an underlying belief that the realm of telecommunications is a vital unifying and informing link between the many regions of Canada and between its two major cultures. This is not a novel belief but the importance of telecommunications is currently being re-emphasized and reconsidered as an integrating force by those respondents who commented on its present

and future status within Canada. Canada's geocultural proximity to the United States is more and more relevant when we consider the ramifications of CATV to Canadian attempts to preserve and develop its own bicultural setting. Similarly, concern was voiced over the difficulties of regaining access to Canadian information stored in data banks resident beyond Canadian boundaries. These are only a few examples of a concern amongst the respondents to the question concerning the role of telecommunications systems in Canada.

(f) Future Changes

Changes in the study of communications are foreseen over the next ten years. Of the Engineering responses, Dalhousie, Sir George Williams and Memorial University of Newfoundland indicated the likely initiation of communications programmes within Electrical Engineering provided sufficient funds are available. UBC, Carleton, Ottawa, Saskatchewan (Regina), Waterloo and Laval suggested the possibility of initiating multidisciplinary programs, although none were too specific in their predictions. Queen's Charles Campling, Head of the Department of Engineering, expects that his Department will join with Carleton's Engineering Department in an Institute for Communications Studies supported in part by the National Research Council, the Department of Communications and private industry. This Institute is not expected to be a multidisciplinary research body in the sense of its linking the technologically-oriented Electrical Engineering studies with the communications studies in the Social Sciences and Humanities. Laurentian University voices the hope that the Engineering

Department will pursue studies in transportation and communications in the "Mid-Canadian Corridor" area in Northern Ontario specifically.

Not all the respondents foresaw positive changes. The University of Manitoba believe there is little future at Manitoba for a multidisciplinary programme. Sir George Williams University seemed particularly dubious of the continuing availability of sufficient financial resources. In general however, we can say that most universities surveyed seemed to be planning for the expansion of presently existing communications programmes within the Applied Science areas of Computer Science and Management Science as well as within the Electrical Engineering Departments. Interest in the application of computers for data storage and analysis appears to be rising in Canadian universities in keeping with the huge expansion in Computer Science course offerings over the last five years. According to the Engineering responses it does not appear that any Canadian university has formulated specific plans for introducing the multidisciplinary variant into the predominantly single discipline programme.

Respondents to the Social Science and Humanities questionnaire were rather positive in their predictions of changes to come in their universities' communications programmes. The University of Montreal is establishing such a programme within its Psychology Department. It will begin its operation in 1971 under the direction of James Taylor, currently at the Annenburg School of Communications at the University of Pennsylvania. The precise nature of its "interdisciplinary character" has not yet been established. UBC's E.I. Signori, of the Department



of Psychology expects that there will be expanded development in the study of psychological and sociological aspects of communications - although not necessarily in a specialized Institute. Queen's Hugh Thorborn of the Political Science Department wishes that there were more courses and these on political communications, propaganda, advertising and broadcasting. The University of Ottawa's J.G. Debanné, Dean of the Faculty of Management Sciences stated that the University of Ottawa is considering a joint programme in Management Information Systems with the Departments of Computer Science and Electrical Engineering. The same Faculty is also currently conducting a research project on behalf of the Telecommission on the optional control of the telecommunications industry in Canada. The University of Western Ontario is planning the development of a Communications Center out of its Journalism Department by 1975-76. The University of Windsor expects to introduce honours and graduate work in their Communications Arts Programme. The University of Saskatchewan's (Regina) Dallas Smythe, Chairman of the Department of Social Studies, predicts greater depth and breadth in the content and scope of the MA Programme in Communications already significantly developed in several cognate disciplines. Simon Fraser University is currently undertaking significant expansion of its Communications Arts programme.

Stanley French, Chairman of the Board of Graduate Studies of Sir George Williams predicted financial cutbacks. This is unfortunate since Sir George Williams currently possesses a vigorous communications programme within the Department of Educational Technology.



The Respondents

E.C. Smith, Vice-Pres., Academic, Acadia University.

Dean P.H. White, Department of Commerce, UBC.

Dr. John Peck, Head Computer Science, UBC.

Dr. J. Kennedy, Computing Centre, UBC.

Mr. C.L. Mitchell, Department of Commerce, UBC.

Mr. L.G. Mitten, Department of Commerce, UBC.

Dean C.A. Plint, Brock University

D.A. George, Dean, Faculty of Engineering, Carleton University.

D.A. Crook, Assistant Dean, Dalhousie University.

H.W. Caldwell, Chairman, Dept. of Extension Education, University of Guelph.

Dr. R.A. Ross, Dean of Science, Lakehead University.

W.Y. Watson, Director, School of Graduate Studies, Laurentian University.

Mr. H.H. Jacobs, Administrative Assistant, Faculty of Graduate Studies,  
University of Manitoba.

Prof. R.J.G. Albers, Dept. of Psychology, U. of Manitoba.

B.G. Hogg, Associate Dean, Faculty of Graduate Studies, U. of Manitoba.

Prof. M.A.K. Hamid, Electrical Engineering, U. of Manitoba.

Prof. E. Bridges, Electrical Engineering, U. of Manitoba.

Prof. Nichols, Acting Dean, Graduate Studies, McGill University.

M.A. Preston, Dean of Graduate Studies, McMaster University.

Dr. C.F. Poole, Vice President Academic, Mount Allison University.

Dr. R.J. Kavanagh, Assoc. Dean of Graduate Studies, University of New Brunswick.

M.R. Foran, Dean of Graduate Studies, Nova Scotia Technical College.



Dean J.G. Debanne', Faculty of Management Sciences, University of Ottawa.

L.A. Beauchesne, Acting Chairman, University of Ottawa.

Dr. C. Lemyre, Associate Professor, University of Ottawa.

Prof. H. Lawford, Queen's University.

H.G. Thorburn, Head of the Department of Political Studies, Queen's University.

Prof. E.R. Black, Associate Professor, Department of Political Studies. Queen's U.

C.H.R. Campling, Professor and Head, Dept. of Electrical Engineering, Queen's  
University.

T.S. Hutchinson, Dean of Graduate Studies, Royal Military College of Canada.

G.B. Hallett, Dean of Arts, Saint Mary's.

A.B. Van Cleave, Dean of Graduate Studies, University of Saskatchewan, Regina  
Campus.

Dr. D.W. Smythe, Chairman, Department of Social Studies, University of  
Saskatchewan, Regina Campus.

B.W. Currie, Vice-President (Research), University of Saskatchewan, Saskatoon  
Campus.

K. McCallum, Dean of Graduate Studies, University of Saskatchewan.

O. Scwelbe, Assoc. Prof., Sir George Williams.

Prof. J.C. Callaghan, Dean of Engineering, Sir George Williams.

Mrs. Rosemary Arthur, Administrative Officer, Graduate Studies, Sir George  
Williams.

Dr. Stanley G. French, Chairman, Board of Graduate Studies, Sir George Williams.

B.R. Blishen, Dean of Graduate Studies, Trent University.

R.H. Sadleir, Vice President (Admin.), Trent University.

Dr. A.R. Fontaine, Associate Dean, Faculty of Graduate Studies, University  
of Victoria.

Dr. L.A.K. Watt, Acting Dean of Graduate Studies, University of Waterloo.

G.E. Cross, Dean of Graduate Studies, University of Waterloo.

Dr. Norman Wagner, Director, Graduate Studies, Waterloo Lutheran.

Dr. James A.F. Stevenson, Dean of Graduate Studies, University of Western Ontario.

Dr. William H. Stockdale, Assistant Dean for Arts and Social Sciences, Faculty  
of Graduate Studies, University of Western Ontario.

Dr. R. Garth Kidd, Assistant Dean for Business and Physical Science, Faculty of  
Graduate Studies, University of Western Ontario.

Dr. Peter A. Forsyth, Director, Center for Radio Science, University of Western  
Ontario.

Dr. C.P. Crowley, Dean of Graduate Studies, University of Windsor,

Mr. Walter Romanow, Acting Head, Department of Communication Services,  
University of Windsor.

M.J. Risi, Directeur, Ecole des gradués, l'Université Laval.

H.J. Schweiger, Vice-Recteur Acad.Univ.de Moncton.

J.G. Fredette, Adjoint au Vice-recteur aux études et à la recherche.  
Université de Montréal.

**Léandre** Bourque, Secrétaire Général , Univ.de Moncton.

James Taylor, Directeur section communication, Institut de psychologie,  
Faculté de philosophie. Université de Montréal.



June 19, 1970.

Prepared by John Foote

Survey of the Multidisciplinary  
Manpower Study Committee  
of the Department of Communications

Questionnaire IScience and Engineering1. Communications Programmes

(a) Does your University have a graduate programme in communications?

Yes ( )

No ( )

(b) If so, in what faculty is it located? \_\_\_\_\_

(c) Please list the courses presently offered in the above programme with a brief description of the contents of each. If you prefer, please attach the appropriate pages in your University calendar to the completed questionnaire.

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2. Student Enrolment

(a) How many graduate students were enrolled during the academic year, 1969 - 1970, in each of the courses listed in 1 (c)?

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- (b) How many graduate students at your University do you estimate will obtain Masters and/or Doctorate degrees in Communications in each of the following years?

1970 \_\_\_\_\_

1971 \_\_\_\_\_

1972 \_\_\_\_\_

1973 \_\_\_\_\_

1974 \_\_\_\_\_

1975 \_\_\_\_\_

### 3. Dissertations

Regardless of whether your University has or has not a graduate programme in Communications, please indicate the number and write a brief description of any dissertations (Masters and Doctoral) involving the field of communications since 1965. Examples of some topics might include "The Economic Effects of Regulatory Legislation in Telecommunications" or "Communication Technology and Participatory Democracy."

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

### 4. Multidisciplinary Involvement

- (a) Does your graduate school permit the taking of courses to be credited towards a degree of Engineering and/or Science in disciplines other than the preceding?

Yes (     )

No (     )

- (b) Are there any plans or expectations to facilitate such studies in the future, at your graduate school?

Yes (     )

No (     )

- (c) If the answer to 4(b) is yes, please describe briefly the plans or expectations.

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#### 5. Opinion on Multidisciplinary Programme

- (a) Are you in favour of allowing graduate students in Engineering and the Sciences at your university who are at the same time interested in the field of communications, to take courses in disciplines other than those in Engineering and the Sciences?

Yes (     )

No (     )

- (b) If your answer to 5(a) is yes, how many graduate courses in such a multidisciplinary programme should be offered in a graduate programme of Communications? Please indicate by checking the appropriate blanks in Table 5(d).
- (c) Should the courses checked in Table 5(d) be made mandatory or optional? Please indicate by placing 'm' or 'o' beside the checks in Table 5(d).

Table 5(d)

No.	Public Admin.	Behav. Sc's	Economics	Languages and Literature	Law	Arch.	Medicine
One							
Two							
Three							

- (e) What do you consider would be the major problems to be faced with such a multidisciplinary graduate programme at your university?

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#### 6. Need for Multidisciplinary Training

- (a) Do you think there is a need for the multidisciplined graduate in the field of communications?

Yes (    )

No (    )

- (b) If the answer to (a) is "yes", do you consider the need to be urgent or not urgent?

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- (c) Do you think that the multidisciplined graduate can meaningfully contribute to:

academic life	Yes (    )	No (    )
private industry	Yes (    )	No (    )
the federal government	Yes (    )	No (    )
the provincial government	Yes (    )	No (    )



## 7. Present Programme Inadequacies

Is your graduate programme in Communications limited at present by inadequacies of any of the following factors? (Indicate where large, small or none by placing "L", "S" or "N" beside each bracket).

- (a) Academic staff (    )
- (b) Graduate Financial assistance (    )
- (c) Research equipment and training facilities (    )
- (d) **Motivated** programme direction (    )
- (e) Other (specify) (    )

## 8. Financial Resources

How much money is currently received by your University for communications activities, from:

- (a) the Federal Government (\$    )
- (b) the Provincial Government (\$    )
- (c) University Sources (\$    )
- (d) Industry (\$    )
- (e) Other (specify) (\$    )

## Future of Communications in Canada

9. Please state your opinion on the following three questions.

- (a) What will be the major areas of interest in communications in Canada over the next ten years?

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(b) What fields of communications are most neglected at present  
in Canada?

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(c) What are likely to be the major changes in the study of  
communications at your university over the next ten years?

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On completion this form is to be forwarded to Mr. De Montigny Marchand,  
Director of Research for the Telecommisssion, Department of Communications,  
100 Metcalfe St., Ottawa, Ontario.

A postage-free return envelope is enclosed for your convenience.

Please complete the following

Name of University

---

Your Name

---

Your title

---

Telephone #

---

Date

---

Please indicate the person, if other than yourself, who should be  
consulted if any questions arise concerning this questionnaire.

Name

---

Title

---

Telephone#

---

June 19, 1970.

Prepared by John Foote

Survey of the Multidisciplinary  
Manpower Study Committee  
of the Department of Communications

Questionnaire IISocial Sciences and Humanities - Professions1. Communications Programmes

(a) Does your University have a graduate programme in communications?

Yes (     )

No (     )

(b) If so, in what faculty is it located? \_\_\_\_\_  
\_\_\_\_\_

(c) Please list the courses presently offered in the above programme with a brief description of the contents of each. If you prefer, please attach the appropriate pages in your University calendar to the completed questionnaire.

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2. Student Enrolment

(a) How many graduate students were enrolled during the academic year, 1969-1970, in each of the courses listed in 1(c)?

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- (b) How many graduate students at your University do you estimate will obtain Masters and/or Doctorate degrees in Communications in each of the following years?

1970 \_\_\_\_\_

1971 \_\_\_\_\_

1972 \_\_\_\_\_

1973 \_\_\_\_\_

1974 \_\_\_\_\_

1975 \_\_\_\_\_

### 3. Dissertations

Regardless of whether your University has or has not a graduate programme in Communications, please indicate the number and write a brief description of any dissertations (Masters and Doctoral) involving the field of communications since 1965. Examples of some topics might include "Communication Overload and Public Inertia" or "The Impact of Technological Innovations in Information Retrieval on Decision - Making Theories".

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

### 4. Multidisciplinary Involvement

- (a) Does your graduate school permit the taking of courses to be credited towards a degree in the behavioral sciences and/or the humanities/professions, in disciplines other than the preceding?

Yes (     )

No (     )

- (b) Are there any plans or expectations to facilitate such studies in the future, at your graduate school?

Yes (     )

No (     )

- (c) If the answer to 4(b) is yes, please describe briefly the plans or expectations.

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#### 5. Opinion on Multidisciplinary Programme

- (a) Are you in favour of allowing graduate students in the behavioral sciences and humanities/professions at your university who are at the same time interested in the field of communications, to take courses in disciplines other than those in the behavioral sciences and the humanities/professions?

Yes (     )

No (     )

- (b) If your answer to 5(a) is yes, how many graduate courses in such a multidisciplinary programme should be offered in a graduate programme of Communications? Please indicate by checking the appropriate blanks in Table 5(d).

- (c) Should the courses checked in Table 5(d) be made mandatory or optional? Please indicate by placing 'm' or 'o' beside the checks in Table 5(d).

Table 5(d)

No.	Engineering	Systems Design	Industrial Design	Computer Science	Physics	Maths.	Other (Specify)
One							
Two							
Three							

- (e) What do you consider would be the major problems to be faced with such an multidisciplinary graduate programme at your university?

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#### 6. Need for Multidisciplinary Training

- (a) Do you think there is a need for the multidisciplined graduate in the field of communications?

Yes (     )

No (     )

- (b) If the answer to (a) is "yes", do you consider the need to be urgent or not urgent?

- (c) Do you think that the multidisciplined graduate can meaningfully contribute to:

academic life	Yes (     )	No (     )
private industry	Yes (     )	No (     )
the federal government	Yes (     )	No (     )
the provincial government	Yes (     )	No (     )

## 7. Present Programme Inadequacies

Is your graduate programme in Communications limited at present by inadequacies of any of the following factors? (Indicate where large, small or none by placing "L" "S" or "N" beside each bracket).

- (a) Academic staff ( )
- (b) Graduate financial assistance ( )
- (c) Research equipment and training facilities ( )
- (d) Motivated programme direction ( )
- (e) Other (specify) ( )

## 8. Financial Resources

How much money is currently received by your University for Communications activities, from:

- (a) The Federal Government (\$ )
- (b) The Provincial Government (\$ )
- (c) University Sources (\$ )
- (d) Industry (\$ )
- (e) Other (Specify) (\$ )

## Future of Communications in Canada

9. Please state your opinion on the following three questions.

- (a) What will be the major areas of interest in communications in Canada over next ten years?

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(b) What fields of communications are most neglected at present in Canada?

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(c) What are likely to be the major changes in the study of communications at your university over the next ten years?

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On completion this form is to be forwarded to Mr. de Montigny Marchand, Director of Research for the Telecommunication, Department of Communications, 100 Metcalfe St., Ottawa, (Ont.). A postage-free return envelope is enclosed for your convenience.

Please complete the following:

Name of University

---

Your Name

---

Your title

---

Telephone #

---

Date

---

Please indicate the person, of other than yourself, who should be consulted if any questions arise concerning this questionnaire.

Name

---

Title

---

Telephone #

---

Communications Programmes and Courses in Canadian  
Universities

Acadia	PEI
Alberta	Queen's
Bishop's	Ottawa
UBC	Royal Military College
Brock	Saint Mary's
Calgary	Saskatchewan (Regina)
Carleton	Saskatchewan (Saskatoon)
Dalhousie	Sir George Williams
Guelph	Simon Fraser
Lakehead	U of Toronto
Lethbridge	Trent
Laurentian/Laurentienne	Victoria
Loyola	Waterloo
McGill	Waterloo Lutheran
McMaster	Western Ontario
Manitoba	Windsor
Memorial	Winnipeg
Mount Allison	York
Mount Saint Vincent	Laval
Northern Alberta Institute of Technology	Moncton
Nova Scotia Technical College	Montréal
Notre Dame	Sherbrooke
	Université du Québec.

This data has been compiled from university calendars and from responses to question No. 1 of the questionnaire. The broadest possible definition of communications has been used in compiling this listing. An early analysis of the calendars showed that courses related to communications appear under the five broad headings of Communications, Business Administration, Education, Electrical Engineering and Computer Science. These headings are used in the following pages. Perhaps the most difficult areas are those of Electrical Engineering and Computer Science since many of these courses are not directly related to communications. Rather than attempt to define the two areas we have included as many of the courses as possible. This is not an exhaustive list of all courses offered and should be used only as a guide.

Note      Graduate courses are identified by (G)  
             Undergraduate courses are identified by (U)

Acadia University  
Wolfville, N.S.

(1) Communications

Sociology 432 - Mass Communications

(2) Business Administration

None

(3) Education

None

(4) Electrical Engineering

None

(5) Computer Science

None

University of Alberta  
Edmonton, Alta.

(1) Communications

Sociology 344 - Public Opinion & Mass Communications (U)  
Psychology 492 - Creativity (U)

(2) Business Administration

Marketing 403 - Communication Processes in Marketing (U)

(3) Education

Education 462 - Audio-Visual Communications (G)  
Education 465 - Audio-Visual Communications (U)

(4) Electrical Engineering

Electrical Engineering 487 - Principles of Communication Theory (U)  
Electrical Engineering 567 - Advanced Communication Theory (G)  
Electrical Engineering 556 - Introduction to Communication Theory (G)  
Electrical Engineering 568 - Sensory Communication Theory (G)

(5) Computer Science

Computing 212 - Introduction (U)  
Computing 305 - Computing Methods for Compilers & Remote Terminals (U)  
Computing 310 - Elements of Programming (U)  
Computing 311 - Elements of Programming (U)  
Computing 312 - Probability, Statistics & Numerical Analysis (U)  
Computing 313 - Computer Programming (U)  
Computing 411 - Computer Languages & their Processors (U)  
Computing 440 - Linear Programming & Matrix Algebra (U)  
Computing 450 - Digital & Analog Computers with Applications in Chemistry (U)  
Computing 459 - Introduction to Scientific Programming (U)  
Computing 460 - Numerical Analysis (U)  
Computing 461 - Structure of Digital Machines (U)  
Computing 511 - Computer Graphics (G)  
Computing 540 - Linear Programming (G)  
Computing 550 - Artificial Intelligence (G)  
Computing 560 - Fundamentals of Information Retrieval (G)  
Computing 561 - Computing Systems (G)  
Computing 570 - Introduction to Automata Theory (G)  
Computing 640 - Advanced Numerical Analysis (G)  
Computing 650 - Advanced Topics in Computing Science (G)  
Business 406 - Computer and Data Processing (U)

Bishop's University  
Lennoxville, P.Q.

(1) Communications

Sociology 322 - The Sociology of Communications(U)

(2) Business Administration

None

(3) Education

None

(4) Electrical Engineering

None

(5) Computer Science

None

University of British Columbia  
Vancouver, B.C.

(1) Communications

Political Science 304 - The Press and Politics (U)

(2) Business Administration

None

(3) Education

Education 538 - Communication Theory (G)

Education 539 - Instructional TV (G)

Education 540 - Design of Instructional Media Systems (G)

Education 543 - Historical Aspects of Speech Communication (G)

(4) Electrical Engineering

Applied Science 455 - Communications Systems (U)

Applied Science 566 - Communications & Information Theory (G)

Applied Science 589 - Man-Machine Communication (G)

(5) Computer Science

Computer Science 501 - Theory of Automata I (G)

Computer Science 502 - Artificial Intelligence I (G)

Computer Science 503 - Computational Linguistics I (G)

Computer Science 504 - Information Retrieval (G)

Computer Science 505 - Simulation Methods (G)

Computer Science 507 - Information Theory (G)

Computer Science 508 - Computer System (G)

Computer Science 509 - Advanced Programming Language I (G)

Computer Science 521 - Theory of Automata II (G)

Computer Science 522 - Artificial Intelligence II (G)

Computer Science 523 - Computational Linguistics II (G)

Computer Science 527 - Coding Theory (G)

Computer Science 529 - Advanced Programming Languages II (G)

Computer Science 530 - Topics in Information Processing (G)

Computer Science 531 - Topics in the Theory of Automata (G)

Computer Science 532 - Topics in Artificial Intelligence (G)

Computer Science 534 - Topics in Information Retrieval (G)

Computer Science 535 - Topics in Simulation (G)

Computer Science 537 - Topics in Coding & Information Theory (G)

Computer Science 538 - Topics in Computer Systems (G)

Computer Science 540 - Topics in Applied Combinatorial Analysis (G)

Computer Science 549 - Master's Thesis (G)

Brock University  
St. Catherine's, Ont.

(1) Communications

None

(2) Business Administration

None

(3) Education

None

(4) Electrical Engineering

None

(5) Computer Science

None



University of Calgary  
Calgary, Alta.

Humanities

(1) Communications

Sociology 345 - Mass Communication (U)  
Sociology 445 - Special Problems in Communication (U)  
Sociology 544 - Seminar in Mass Communications (G)  
Drama 412 - TV Production (U)

(2) Business Administration

Marketing 455 - Marketing Communication (U)  
Marketing 456 - Management of the Marketing Communication System (U)  
Management Science 280 - Information Systems (U)  
Management Science 281 - Information Management (U)

(3) Education

Education 202 - Communication in the School (U)  
Education 663 --Systems Approach to Instructional Media (G)

(4) Electrical Engineering

Engineering 570 - Communication Systems (G)  
Engineering 572 - Control (G)  
Engineering 576 - Systems Analysis (G)

(5) Computer Science

Computer Science 201 - Introduction to Computer Programming (U)  
Computer Science 203 - Elementary Programming for Business (U)  
Computer Science 205 - Elementary Programming for Social Science (U)  
Computer Science 207 - Elementary Programming for Natural Science (U)  
Computer Science 209 - Elementary Programming for Humanities (U)  
Computer Science 221 - Elements of Computing Equipment (U)  
Computer Science 223 - Introduction to Data Processing Equipment (U)  
Computer Science 350 - Introduction to Computer Programming (U)  
Computer Science 354 - Introduction to Computer Programming (U)  
Computer Science 356 - Introduction to Computer Programming (U)  
Computer Science 368 - Digital Computer: Concepts & Organization (U)  
Computer Science 376 - Numerical Methods (U)  
Computer Science 450 - Advanced Programming Techniques (U)  
Computer Science 453 - Information Structures (U)  
Computer Science 468 - Automata & Languages (U)  
Computer Science 471 - Numerical Analysis I (U)  
Computer Science 473 - Numerical Analysis II (U)  
Computer Science 564 - Algorithmic Languages (G)  
Computer Science 566 - Introduction to Information Theory (G)  
Computer Science 568 - Automata Theory (G)  
Computer Science 570 - Non-numeric Computing (G)  
Computer Science 571 - Numerical Analysis I (G)

(5) Computer Science (Cont'd)

Computer Science 573 - Numerical Analysis II (G)  
Computer Science 575 - Numerical Analysis III (G)  
Computer Science 577 - Numerical Analysis IV (G)

Carleton University  
Ottawa, Ont.

(1) Communications

Journalism 28.100 - Introduction to Human Communication (U)  
 Journalism 28.101 - Journalism Workshop (U)  
 Journalism 28.200 - Problems of Mass Media (U)  
 Journalism 28.201 - Mass Media in Canada (U)  
 Journalism 28.220 - Fundamentals of Reporting (U)  
 Journalism 28.300 - Modern Environment (Interdisciplinary)(U)  
 Journalism 28.320 - Interpretative Reporting & Editing (U)  
 Journalism 28.321 - Career Seminars (U)  
 Journalism 28.330 - Editing (U)  
 Journalism 28.340 - Interpretative Journalism (U)  
 Journalism 28.350 - Career Seminar in Journalism (U)  
 Journalism 28.400 - Basic Issues (Interdisciplinary)(U)  
 Journalism 28.401 - Perspectives on Modern Society (U)  
 Journalism 28.402 - Public Issues & Problems (U)  
 Journalism 28.410 - Press in Modern Society (U)  
 Journalism 28.430 - Editorial Practice & Policy (U)  
 Journalism 28.440 - Modern News Reporting (U)  
 Journalism 28.490 - Honour Tutorial (U)  
 Journalism 28.497 - Reporting on the Biosphere (Interdisciplinary)(U)  
 Journalism 28.498 - Honours Research (U)  
 Journalism 28.499 - Research Credit (Interdisciplinary)(U)  
 Political Science 47.403 - Politics & the Media (U)  
 Anthropology 54.430 - Culture & Communication (U)

(2) Business Administration

None

(3) Education

None

(4) Electrical Engineering

Electrical Engineering 94.552  
 Electrical Engineering 94.553  
 Electrical Engineering 94.554  
 Electrical Engineering 94.556  
 Electrical Engineering 94.564  
 Electrical Engineering 94.565  
 Electrical Engineering 94.584

(5) Computer Science

Computer Science 95.100 - Basic Programming (U)  
Engineering 95.165 - Introduction to Computers(U)  
Computer Science 95.200 - Computing Science I (U)  
Computer Science 95.201 - Computing Science II (U)  
Engineering 95.265 - Computer Programming (U)  
Computer Science 95.300 - Programming Languages & Supervisory Systems(U)  
Engineering 95.303 - Real Time & Hybrid Computing (U)  
Engineering 95.366 - Computer Applications (U)  
Computer Science 95.400 - Computer Organization & Applications(U)

N.B.      Architecture 76.300-(U)Interdisciplinary Course on "culture" and  
             "technology" of which the latter includes the topics of systems  
             analysis, value engineering, marketing, cybernetics, transpor-  
             tation, industrialization, energy systems and communications  
             systems.

Architecture 79.310 - Information Systems (U)  
Architecture 80.328 - Workshop: Audio-Visual Development (U)

Dalhousie University  
Halifax, N.S.

(1) Communications

None

(2) Business Administration

Commerce 318A - Marketing Research & Information Systems (U)

Commerce 306 - Human Communications & Personnel Mgt. Process (U)

(3) Education

None

(4) Electrical Engineering

None

(5) Computer Science

Mathematics 535 - Advanced Numerical Analysis (G)

Mathematics 540 - Structure of Computer Languages & Special Applications

Mathematics 545 - Computer Applications in Operations Research (G)

Mathematics 240 - Introduction in Computer Science (U)

University of Guelph  
Guelph, Ont.

Humanities

(1) Communications

Consumer Studies 28.302 - Communications I (U)  
Consumer Studies 28.303 - Communications II (U)  
Family Studies 39.303 - Communications with Families (U)

(2) Business Administration

None

(3) Education

Extension Education 38.616 - Communication Theory (U)  
Extension Education 38.618 - Communication Practice (U)  
Extension Education 38.636 - Communication & Organizational Behaviour (U)  
Extension Education 38.023 - Communications (U)  
Extension Education 38.304 - Communication Process (U)  
Extension Education 38.306 - International Communications (U)  
Extension Education 38.308 - Technology in Extension Education (U)

(4) Electrical Engineering

None

(5) Computer Science

Computer Science 27-201 - Introduction to Computer Programming (U)  
Computer Science 27-202 - Computers and Programming (U)  
Computer Science 27-240 - Introduction to Information Processing (U)  
Computer Science 27-420 - Computer Communication & Interfaces (U)  
Computer Science 27-421 - Large scale Info. Processing Systems (U)  
Computer Science 27-443 - Info. Org. and Retrieval

Lakehead University  
Port Arthur, Ont.

Humanities

(1) Communications

English ET 3e - Communications (U)

(2) Business Administration

None

(3) Education

Education 210 - Communication (U)

(4) Electrical Engineering

Engineering ET3e - Communication (U)

(5) Computer Science

Mathematics 2C54 - Introduction in Theory of Computer Science (U)

Mathematics 2C56 - Introduction in Theory of Computer Science (U)

Mathematics 3C56 - Problem Oriented Programming Language (U)

Mathematics 4C56 - Machine Languages & Computer Organization

Mathematics 4CB6 - Programming Languages & Computers(U)

Mathematics 4CC6 - Systems and Applications (U)

Mathematics 4CD3 - Automata Theory (U)

Mathematics 4CC3 - Operative Research Applications (U)

Business 206 - Computer Concepts (U)

Business 400 - Operations Research - Theory & Computer Applications (U)

Business 402 - Systems and Procedures (U)

Computer T1a - Basic Computer (U)

Computer T2a - Programming (U)



Laurentian University/Université Laurentienne  
Sudbury, Ont.

Humanities

(1) Communications

Psychology 465 - Audiological & Communication Psychology (U)

(2) Business Administration

Commerce 433a - Marketing Communication (U)

(3) Education

None

(4) Electrical Engineering

None

(5) Computer Science

Mathematics 14 - Intro. to Computer Science & Numerical Analysis (U)

Computer Science 10 - Computer Concepts & Fortran Programming (U)

Computer Science 20 - Techniques in Computer Science & Data Processing (U)

Mathematics 442 - Topics in Computer Science

Université Laval  
Québec, P.Q.

(1) Communication

Baccalauréat ès arts (Mention journalisme et information)

Information 101: La communication  
 Information 102: Histoire de l'information collective  
 Information 201: Les sources de l'information  
 Information 202: La loi et l'information  
 Information 203: Les genres rédactionnels  
 Information 204: Stylistique  
 Information 301: L'opinion publique  
 Information 302: Etude comparative de traitement de l'information  
 Information 303: Déontologie  
 Information 311: La publication du journal  
 Information 312: Connaissance de l'actualité  
 Information 313: L'information dans la société canadienne-française  
 Information 314: Relations publiques et publicité  
 Information 315: L'information gouvernementale  
 Information 316: Les rubriques spécialisées  
 Information 317: Les théories modernes de la communication  
 Information 318: L'entreprise de communication  
 Information 319: La presse étrangère contemporaine  
 Information 320: Les journaux de groupe et la presse de province  
 Information 321: L'information radiophonique et télévisée

(2) Administration

GC 152      Publicité et communication  
 DMN 512      Système, ordinateurs et jeu d'entreprises  
 DMN 454      Système d'information  
 DMN 426      L'informatique

(3) Education

Communication humaine et relation pédagogique

(4) Génie Electrique

Voir science d'ordinateur

**(5) Science d'ordinateur**

15.01	Eléments d'informatique
15.02	Ordinateur et programmation
15.05	Structures de données
15.06	Langages de programmation
15.07	Organisation des calculateurs
15.08	Systèmes d'exploitation
15.15	Dépistage de l'information
15.18	Mesure et analyse des données aléatoires

University of Lethbridge  
Lethbridge, Alta.

(1) Communications

None

(2) Business Administration

None

(3) Education

None

(4) Electrical Engineering

None

(5) Computer Science

Computer Science 2600 - Introduction (U)

Computer Science 2650 - Programming & Data Processing (U)

Computer Science 2670 - Numerical Methods (U)

Computer Science 3600 - Theory of Digital Machines (U)

Loyola University  
Montréal, P.Q.

(1) Communications

Communications Arts 200 - Explorations in Communications (U)  
 Communications Arts 205 - Communications Analysis (U)  
 Communications Arts 260 - Photography as Visual Language (U)  
 Communications Arts 270 - Fundamentals of Radio Production I (U)  
 Communications Arts 275 - Fundamentals of Radio Production II (U)  
 Communications Arts 300 - Mass Media & Cultural Forms (U)  
 Communications Arts 305 - Mass Society (U)  
 Communications Arts 310 - Basics of Actional Script Writing (U)  
 Communications Arts 320 - Communication by Speech (U)  
 Communications Arts 325 - Small Group Interaction (U)  
 Communications Arts 330 - Silent Cinema (U)  
 Communications Arts 335 - The Talkies (U)  
 Communications Arts 340 - Documentary Film (U)  
 Communications Arts 355 - Communications Research (U)  
 Communications Arts 360 - Elementary Film Making I (U)  
 Communications Arts 365 - Elementary Film Making II (U)  
 Communications Arts 370 - Fundamentals of TV Production I (U)  
 Communications Arts 375 - Fundamentals of TV Production II (U)  
 Communications Arts 400 - Mass Communication (U)  
 Communications Arts 405 - Psychology of Communication (U)  
 Communications Arts 410 - Writing for Film & TV (U)  
 Communications Arts 415 - Seminar in Advertising (U)  
 Communications Arts 420 - Propaganda (U)  
 Communications Arts 430 - Contemporary Cinema (U)  
 Communications Arts 435 - Film Ideas (U)  
 Communications Arts 440 - Experimental Cinema - Animation (U)  
 Communications Arts 450 - Seminar in Contemp. Mass Media & Revelation (U)  
 Communications Arts 455 - Communication Programming (U)  
 Communications Arts 460 - Experimental Workshop in Motion Pictures (U)  
 Communications Arts 470 - Experimental Workshop in TV (U)  
 Communications Arts 500 - History of Communications Arts (U)  
 Communications Arts 600 - Education in Communications Arts (U)

(2) Business Administration

None

(3) Education

None

(4) Electrical Engineering

None

(5) Computer Science

- 100 Survey of Computers
- 101 Fortran Programming for Engineers
- 110 Computer Applications
- 201 Organization of Data
- 211 Elementary Computer Programming
- 220 Business Applications of computers
- 241 Scientific Problem. Solving with Fortran
- 1042 Computer Programming for Engineers

McGill University  
Montréal, P.Q.

(1) Communications

E. 29, English 201 - Communications, Literature & Society  
Anthropology 310b - Anthropology of Communication  
Sociology 317b - Mass Communications  
Sociology 630a - Seminar: Social Communications Personality  
Political Science 312b - Public Opinion

(2) Business Administration

None

(3) Education

None

(4) Electrical Engineering

Electrical Engineering 482T - Communications I (U)  
Electrical Engineering 483T - Communications II (U)  
Electrical Engineering 484T - Programming Languages & Systems (U)  
Electrical Engineering 497T - Communications Technology (U)  
Electrical Engineering 484H - Communications Theory I (U)  
Electrical Engineering 485H - Communications Theory II (U)  
Electrical Engineering G420 - Information Theory (G)  
Electrical Engineering G465 - Sensory Communication Theory (G)

(5) Computer Science

Mathematics 247a, b - Introduction to Digital Computing (U)  
Mathematics 248b - Computer Organization (U)  
Mathematics 359b - Methods of Numerical Analysis (U)  
Engineering 492 - Computing Methods (U)  
Engineering 1243 - Digital Computing (U)  
Engineering 1244 - Digital Computing (U)  
Engineering G418 - Computer Control Systems (G)  
Business 603 - Computer & Data Processing (G)  
Business 340 - Introduction to Computer - Based Information Systems (U)

N.B. Engineering 132 - Communication, Behavior & Architecture I  
School of Human Communication Disorders

610 - Speech Science  
611 - Psycho - acoustics & Audiology  
612 - Physiology of Speech & Hearing



N.B. (Cont'd)

- 613 - Speech & Language Pathology
- 620 - Human Communication Disorders
- 621 - Advanced Audiology
- 622 - Advanced Speech Pathology
- 623 - Rehabilitation of the Aurally Handicapped
- 630 - Medical Orientation
- 640 - Research Methods
- 641 - Research Seminar
- 650 - Seminar in Human Communication Disorders
- 660 - Lectures & Research on Selected Advanced Topics

McMaster University  
Hamilton, Ont.

(1) Communications

English 3X3 - The Art of the Film (U)

(2) Business Administration

Commerce 4N3 - Consumer Motivation & Communications (U)

Commerce 3H3 - Management Information Technology (U)

Commerce 4D3 - Accounting Information Systems(U)

Commerce 703 - Accounting Information Systems(G)

Commerce 745 - Marketing Communications (G)

Commerce 763 - Management Information Technology (G)

Commerce 764 - Management Information Systems(G)

(3) Education

None

(4) Electrical Engineering

Engineering 4A4 - Communication Systems(U)

Engineering 751 - Communication Systems(G)

Engineering 766 - Digital Communication Systems(G)

Engineering 750 - Statistical Information Theory (G)

Engineering 752 - Non-linear & Time-Varying Networks (G)

Engineering 757 - Basic System Theory (G)

Engineering 758 - Discrete - Time Control Systems (G)

Engineering 760 - Optimal Control Theory (G)

Engineering 761 - Non-linear - Control System Theory (G)

Engineering 762 - Pulse Systems (G)

Engineering 763 - Switching Systems & Logical Design (G)

Engineering 764 - Network Theory (G)

Engineering 765 - Digital Signal Processing (G)

Engineering 767 - Optimal Estimation (G)

Engineering 768 - Sequential Machines & Automata Theory (G)

Engineering 769 - Computer-aided Network Optimization

Engineering 790 - Transmission & Modulation Techniques

Engineering 791 - Optimum Filtering & Detection

Engineering 792 - Information Theory & Coding

(5) Computer Science

Applied Mathematics 2H2 - Introduction to Computing (U)

Applied Mathematics 2H3 - Introducing to Computing (U)

Applied Mathematics 3F4 - Numerical Analysis (U)

Applied Mathematics 3G6 - Scientific Data Processing (U)

(5) Computer Science Cont'd

Applied Mathematics 3H6 - Business Data Processing (U)  
Applied Mathematics 4D3 - Computer Hardware Organization (U)  
Applied Mathematics 4E6 - Operating Systems & Compilers (U)  
Applied Mathematics 4E3 - Operating Systems & Compilers (U)  
Applied Mathematics 4H6 - Advanced Programming (U)  
Applied Mathematics 4H3 - Advanced Programming (U)  
Sociology 4E3 - Computer Methods (U)  
Sociology 6E3 - Computer Application (G)  
Applied Mathematics 6D3 - Computer Hardware Organization (G)  
Applied Mathematics 6E6 - Operating Systems & Compilers (G)  
Applied Mathematics 6E3 - Operating Systems & Compilers (G)  
Applied Mathematics 711 - Computer Software I (G)  
Applied Mathematics 712 - Computer Software II (G)  
Applied Mathematics 721 - Computer Hardware I (G)  
Applied Mathematics 722 - Computer Hardware II (G)  
Applied Mathematics 731 - Scientific Data Processing (G)  
Applied Mathematics 732 - Non-numerical Data Processing (G)

N.B. Research in Communication (Electrical Engineering):  
Active filters, digital filters, adaptive receivers,  
delay-lock receivers, digital communication systems,  
image processing, coding theory and signal design,  
data compression, non-linear autonomous systems,  
speech analysis and recognition.

Research in computer-aided design, computers and  
control systems in the Data Processing and Computing  
Centre, directed by E.L. Keech.

University of Manitoba  
Winnipeg, Man.

(1) Communications

Sociology 77.341 - Communication & the Social Process (U)  
Sociology 77.334 - Small Group Interaction (U)  
Psychology 17.751 - Psychology of Small Group Interaction (U)  
Psychology 17.745 - Psychology of Group Behavior (U)

(2) Business Administration

27.327 Communications in Marketing.

(3) Education

(4) Electrical Engineering

24.706 - Synthesis  
24.711 - Circuit Theory  
24.712 - Engineering Analysis  
24.715 - Communication Theory  
24.726 - Microwave Generation & Radiation  
24.727 - Scattering & Diffraction of Electromagnetic Waves  
24.732 - Sampled - Data Control Systems  
24.734 - Analogue & Hybrid Techniques  
24.735 - Engineering Applications of linear graphs  
24.737 - Time-Variant Linear Systems  
24.739 - N-Port Network Theory  
24.740 - Analytical Techniques of Microwave Engineering  
24.742 - Propagation in Anisotropic Media  
24.743 - Experimental Methods in Microwave Engineering  
24.747 - Switching Systems Design Engineering  
24.748 - Digital Electronics Engineering  
24.752 - Active Network Synthesis  
24.754 - Selected Topics of Solid State Electronics  
24.767 - Optimization Methods for Computer - Aided Design  
24.770 - Non-linear Systems Analysis I  
24.771 - Non-linear Systems Analysis II  
24.774 - Physical Electronics I. Fundamental Principles  
24.775 - Physical Electronics II. Properties of Materials  
24.776 - Micro-electronics  
24.777 - Microwave Holography  
24.778 - Microwave Circuits  
24.779 - Microwave Filters  
24.781 - Solution of Fields by Numerical Methods I  
24.782 - Solution of Fields by Numerical Methods II

(5) Computer Science

- 74.120 - Introductory Computer Science (U)
- 74.121 - Elements of Computer Science (U)
- 74.122 - Computers and the Modern World (U)
- 74.206 - Discrete Structures and Programming (U)
- 74.305 - Introduction to ALGOL (U)
- 74.306 - Computers and Programming (U)
- 74.307 - Introduction to System Analysis (U)
- 74.315 - Programming Languages (U)
- 74.318 - Introductory Numerical Analysis (U)
- 74.403 - Computer Analysis (U)
- 74.407 - Introduction to Logic Design (U)
- 74.404 - Numerical Analysis (G)
- 74.408 - Advanced Data Structures (G)
- 74.413 - Systems Programming (G)
- 74.415 - Compiler Construction (G)
- 74.417 - Introduction to Machine Intelligence
- 74.202 - Introduction to Computing
- 74.205 - Introduction to Business Data Processing
- 74.207 - Numerical Algebraic and Introduction to Numerical Analysis

Memorial University of Newfoundland  
St. John's, Newfld.

(1) Communications

Political Science 3510 - Public Opinion (U)  
Psychology 415C - Communication (U)  
Philosophy 2010 - Inquiry & Communication (U)  
Political Science 3511 - Political Communication (U)

(2) Business Administration

Commerce 2200 - Business Communications (U)

(3) Education

Education 2040 - Oral Communication (U)  
Education 3080 - Theory & Practise of Oral Communication (U)

(4) Electrical Engineering

None

(5) Computer Science

Mathematics 2600 - Intro. to Computing I (U)  
Mathematics 2601 - Intro. to Computing II (U)  
Mathematics 3700 - Intro. to Computer System I (U)  
Mathematics 3701 - Intro. to Computer System II (U)

N.B. Extension Service - Community Development Film Unit

Université de Moncton  
Moncton, N.B.

(1) Communications

Arts Visuels 1500 - Appréciation des Beaux-Arts (U)

Sociologie 5402 - Séminaire sur la sociologie des Communications (G)

(2) Administration

Administration 3500 - Economie de l'information (U)

Commerce 3600 - Introduction à l'informatique (U)

SE 3400 - Business Communication (U)

(3) Education

Aucun

(4) Génie Electrique

GE 5262 - Analyse des systèmes (G)

(5) La Science des ordinateurs

Mathématiques 2202 - Programmation (U)



Mount Allison University  
Sackville, N.B.

(1) Communications

Sociology 460 - Social & Collective Behavior (U)

(2) Business Administration

None

(3) Education

None

(4) Electrical Engineering

None

(5) Computer Science

Engineering 210 - Introduction to Computers (U)

Mathematics 370 - Numerical Analysis (U)

Mount Saint Vincent University  
Halifax, N.S.

(1) Communications

Business 306 - Communications Media (U)  
Speech 100 - Speech (U)  
Speech 300 - Advanced Speech (U)

(2) Business Administration

Business 305 - Business Communications (U)

(3) Education

None

(4) Electrical Engineering

None

(5) Computer Science

None

Northern Alberta Institute of Technology  
Edmonton, Alta.

(1) Communications

Communication Arts 104 - Mass Communications (U)  
Communication Arts 105 - Effective Communications (U)  
Communication Arts 202 - Communications through Drama (U)  
Communication Arts 203 - Visual Communications (U)

(2) Business Administration

None

(3) Education

None

(4) Electrical Engineering

None

(5) Computer Science

None

Notre Dame University  
Nelson, B.C.

Humanities

(1) Communications

None

(2) Business Administration

None

(3) Education

None

(4) Electrical Engineering

None

(5) Computer Science

None

Nova Scotia Technical College(1) Communications

None

(2) Business Administration

None

(3) Education

None

(4) Electrical Engineering

1255 - Theory and Design of Digital Machines

1256 - Statistical Communication Theory

2250 - Modern Developments in Network Theory

2256 - Advanced Concepts of Decision Theory

(5) Computer Science

None

Université de Montréal  
Montréal, P.Q.

(1) Communications

Cinéma A 152 - Les Genres Cinématographiques (S)  
 Cinéma A 153 - Le Cinéma et les autres arts (S)  
 Cinéma A 251 - Histoire du cinéma (S)  
 Cinéma 301 - L'histoire du cinéma (S)  
 Cinéma 501 - Esthétique et psychologie (S)  
 Cinéma 608 - Sociologie du cinéma (G)  
 Cinéma 601 - Séminaire d'études cinématographiques (G)  
 Cinéma 602 - Séminaire sur les créations (G)  
 Cinéma 201 - Introduction générale aux critiques du cinéma (S)  
 Psychologie 650 - Perception sociale et communication humaine (G)  
 Psychologie 651 - Langage et psychologie de la communication humaine (G)  
 Psychologie 607 - Implications psychologiques de la cybernétique (S)  
 Psychologie 652 - Etude psychologique des techniques de diffusion (G)  
 Anthropologie 381 - Ethnologie de la communication (S)  
 Anthropologie 384 - Séminaire d'ethno-linguistique I (S)  
 Anthropologie 385 - Séminaire d'ethno-linguistique II (S)  
 Anthropologie 415 - Ethnocinématographie (S)  
 Sociologie 215A - Communications de masse (S)  
 Sociologie 522 - Sociologie du cinéma (G)  
 Sociologie 431 - Sociologie de la communication (S)  
 Géographie 370 - Transports et communications (G)  
 Science Politique 645 - Attitudes et opinions politiques (G)  
 Philosophie 604 - Philosophie du langage (G)  
 Philosophie 7035 - Séminaire de langage (G)  
 Philosophie 705 - Philosophie du langage (G)  
 LING 225X-1-2 Communication orale  
 LING 205X-1-2 Communication écrite: le français, langue des affaires  
 PSY 230X - La communication dans la relation interpersonnelle  
 SOC 210X - L'information parlée, écrite et télévisée: peut-on s'y fier?  
 PUBL 100X-1 - Intro à la publicité  
 RP 100 - Intro aux relations publiques  
 TVRD 100X - Ateliers d'initiation aux media  
 EDIT 102X - Edition  
 OPTO 001 - Stages de lecture accélérée.

(2) Administration

Aucun

(3) Education

Education audiovisuelle 620 - Théories de la communication (G)  
 Education audiovisuelle 200 - Documents audio-visuels (S)  
 Education audiovisuelle 210 - Laboratoire audio visuel II (S)  
 Education audiovisuelle 305 - Nature et rôle de l'image dans l'enseignement (S)  
 Education audiovisuelle 310 - La technologie du service de l'éducation (S)  
 Education audiovisuelle 330 - La photographie dans l'enseignement (S)  
 Education audiovisuelle 340 - Le son dans l'enseignement (S)  
 Education audiovisuelle 350 - Le cinéma dans l'enseignement (S)  
 Education audiovisuelle 360 - La TV dans l'enseignement (S)  
 Education audiovisuelle 610 - Org. et admin. d'un centre de documentation  
 audio-visuelle (G)  
 TECH 100X - Qu'est-ce que l'informatique?

(4) Génie Electrique

L'Ecole polytechnique

EE 3.514 - Technique des circuits impulsionnels  
 EE 3.523 - Hyperfréquences II  
 EE 3.531 - Synthèse des circuits  
 EE 3.532 - Système de communications  
 EE 3.502 - L'information et l'ordinateur  
 EE 505 - Programmation en langages d'assemblée

(5) Science d'ordinateur

Architecture 622 - L'ordinateur et ses applications en aménagement (G)  
 Informatique 300L - Introduction à la programmation (S)  
 Informatique 100L - Introduction à la programmation (S)  
 Informatique 200L - Introduction à la programmation (S)  
 Informatique 101L - Introduction à la programmation (S)  
 Informatique 104L - Introduction à la programmation (S)  
 Informatique 102L - Compléments de programmation (S)  
 Informatique 201L - Programmation interne des ordinateurs (S)  
 Informatique 202L - Langages de programmation (S)  
 Informatique 203 - Méthodes d'analyse quantitative en linguistique (S)  
 Informatique 210L - Compléments de programmation (S)  
 Informatique 211 - Informatique linguistique (S)  
 Informatique 212L - Algèbre de Boole et application (S)  
 Informatique 220L - Compléments de programmation (S)  
 Informatique 301L - Eléments d'informatique (S)  
 Informatique 302L - Structure des informations (S)  
 Informatique 303L - Systèmes de programmation (S)  
 Informatique 304L - Simulation et modèles (S)



(5) Science d'ordinateur

Informatique 306L - Systèmes et langages formels (S)  
 Informatique 309 - Séminaire (S)  
 Informatique 311L - Automates et systèmes formels (S)  
 Informatique 316L - Langages formels (S)  
 Informatique 318L - Affichage graphique (S)  
 Informatique 323L - Techniques de compilation (S)  
 Informatique 330L - Introduction à la programmation mathématique (S)  
 Informatique 331L - Eléments de la théorie des graphes et applications (S)  
 Informatique 332L - Programmation Mathématique (S)  
 Informatique 333L - Méthodes Statistique en recherche opérationnelle(S)  
 Informatique 334L - Simulation et modèles (S)  
 Informatique 335L - Programmation de gestion (S)  
 Informatique 339 - Séminaire (S)  
 Informatique 349 - Séminaire (S)  
 Informatique 603C - Systèmes de programmation I (G)  
 Informatique 604C - Systèmes de programmation II (G)  
 Informatique 609 - Séminaire I (G)  
 Informatique 611L - Théorie des automates I (G)  
 Informatique 612 - Calculabilité et décidabilité (G)  
 Informatique 613C - Intelligence artificielle (G)  
 Informatique 614L - Reconnaissance des formes (G)  
 Informatique 615 - Théories des automates II (G)  
 Informatique 616L - Théorie des langages formels I (G)  
 Informatique 617L - Théorie des langages formels II (G)  
 Informatique 618L - Traitement des infor. graphiques (G)  
 Informatique 619 - Séminaire II (G)  
 Informatique 622L - Traduction automate (G)  
 Informatique 623L - Traitement des expressions symb. (G)  
 Informatique 624L - Dépistage de l'info. (G)  
 Informatique 629 - Séminaire III (G)  
 Informatique 630L - Traitement de l'info. en recherche opérationnelle (G)  
 Informatique 631L - Méthodes statistiques en recherche opérationnelle I (G)  
 Informatique 633L - Méthodes statistiques en recherche opérationnelle II (G)  
 Informatique 634L - Programmation mathématique II (G)  
 Informatique 635L - Programmation mathématique III (G)  
 Informatique 638 - Etude de cas en recherche opérationnelle (G)  
 Informatique 639 - Séminaire IV (G)  
 Informatique 641L - Analyse numérique II (G)  
 Informatique 643L - Solution numérique des équations différentielles (G)  
 Informatique 644L - Solution numérique des équations aux dérivées  
 partielles (G)  
 Informatique 645L - Solution numérique des problèmes matriciels (G)  
 Informatique 649 - Séminaire (G)  
 Informatique 668 - Analyse numérique (G)  
 Informatique 678 - Théorie de l'approximation (G)

(5) Science d'ordinateur

L'Ecole Polytechnique

Science des Ordinateurs 3.503 - Langages de programmation

Science des Ordinateurs 3.504 - Méthodes numériques

Science des Ordinateurs 3.505 - Programmation des organes de machines

Science des Ordinateurs 3.511 - Communication

N.B.    Architecture 124 - Méthodes de communication (S)  
              (Faculté de l'Aménagement)

Aussi Design 124 - Méthodes de communication (design industriel) (S)

Design 224 - Méthodes de communication (S)

Design 324 - Communication audio-visuelle (S)

Aussi Paysagisme 124 - Méthodes de communication (S)

Université d'Ottawa/University of Ottawa  
Ottawa, Ont.

(1) Communications

Art 2430 - Histoire de l'Art cinématographique  
Art 3430 - Atelier de cinéma  
Art 4433 - Cinéma Contemporain  
Art 4453 - Cinéma Canadien  
Art 4472 - L'art et la communication  
Philosophie 3232 - Philosophie sociale des communications

(2) Business Administration (Management Science)

Public Administration 4861 - Public Information  
Management 4496 - Decision Theory

(3) Education

None

(4) Electrical Engineering

EE 5602 - Microwave Circuits (G)  
EE 5631 - Information Theory & Coding (G)  
EE 5654 - Modern Communications & Computers (G)  
EE 5655 - Pulse Code Modulation (G)  
EE 5410 - Stochastic Processes (G)  
EE 5847 - Digital Electronics for Computers & Communications (G)  
EE 5400 - System Theory (G)  
EE 5630 - Theory of Coding with Application (G)  
EE 5633 - Digital Communication Systems (G)  
EE 4532 - Communications Engineering (U)  
EE 4610 - Systems Engineering (U)

(5) Computer Science

Education 0603 - Introduction to Computer Usage in Educational Research  
Electrical Engineering 4533 - Computer Electronics  
Electrical Engineering 4645 - Design of Digital Computer Logic  
Electrical Engineering 4650 - Engineering Applications of Computers  
Computer Science 2000 - Introduction to Computing  
Computer Science 2001 - Numerical Methods  
Computer Science 3000 - Algorithmic Languages  
Computer Science 3201 - Logic Circuits I  
Computer Science 3203 - Logic Circuits II  
Computer Science 3211 - Design of Digital Computer Logic  
Computer Science 3444 - Seminar  
Computer Science 4000 - Computability & Heuristic Programming  
Computer Science 4201 - Theory of Automata I  
Computer Science 4203 - Theory of Automata II  
Computer Science 4500 - Analog & Hybrid Computers

University of Prince Edward Island  
Charlottetown, P.E.I.

(1) Communications

Education 220 - Communications Arts (U)

(2) Business Administration

None

(3) Education

None

(4) Electrical Engineering

None

(5) Computer Science

None

Université du Québec  
Chicoutimi, P.Q.

(1) Communications

- 2 MAR 400 - Théorie de la communication
- 3 PED 605 - Communication humaine

(2) Administration

- 2 M6Q 401 - Informatique & jeux d'entreprise

(3) Education

Aucun

(4) Génie Electrique

- 1 GEL 707 - Introduction aux micro-ondes
- 1 GEL 708 - Systèmes de communication

(5) Science d'ordinateur

- 2 MQG 300 - Informatique I

Université du Québec  
Montréal, P.Q.

(1) Communications

- A.S.T. 301 - Stage en psychologie de la communication
- A.S.T. 402 - Stage-terrain en communication
- SCPOL 505 - Comportement et opinion publique
- SOC 320 - Sociologie des mass media
- STEC 524 - Communications
- AC 150 - Séminaire technique et production I (techniques d'écriture, de théâtre 1 et 2, de cinéma 1 et 2 ou de radio-télévision)
- AC 250 - Séminaire technique et production II (techniques d'écriture, de théâtre 3 et 4, de cinéma 3 et 4 ou de radio-télévision)
- AC 350 - Séminaire technique et production III (techniques d'écriture, de théâtre 5 et 6, de cinéma 5 ou de radio-télévision)
- AC 450 - Séminaire technique et production IV (techniques d'écriture, de théâtre 7 et 8, de cinéma 5 ou de radio-télévision)
- AC 525 - Séminaire critique et production I (essai de mise en relation de la théorie et de la pratique stages)

TECHNIQUE DE CINEMA 1

Scénarisation 1: élaboration d'idées de films, fabrication de synopsis, mise au point de quelques séquences, production d'un scénario de dix minutes.

TECHNIQUE DE CINEMA 2

Réalisation 1: techniques de tournage (image, son, réalisation). Production d'un film de 10 minutes (8 ou super 8).

TECHNIQUE DE CINEMA 3

Montage 1: Technique du montage. Pratique à partir du matériel réalisé par l'étudiant.

TECHNIQUE DE CINEMA 4

Bande sonore, musique, finition proprement dite (mixage, etc.) Circuits de distribution. Marché du film.

TECHNIQUE DE CINEMA 5

A déterminer.



TECHNIQUE DE CINEMA 6 (Techniques orientées)

A déterminer

TECHNIQUE DE CINEMA 7 (Techniques orientées)

Le cinéma comme moyen d'information  
culturelle.

TECHNIQUE DE CINEMA 8 (Techniques orientées)

Séminaire-rencontre sur les techniques  
d'animation et le cinéma.

TECHNIQUE DE CINEMA 9 (Techniques orientées)

Séminaire-rencontre sur la diffusion de la  
recherche par le cinéma (et T.V.).

TECHNIQUE DE CINEMA 10 (Techniques orientées)

Séminaire-rencontre sur le film pédagogique.  
Séminaire sur l'utilisation de l'image en  
éducation appliquée au secondaire.

Médium radio-télévision

TECHNIQUE DE RADIO-TELEVISION 1

Télévision. Scénarisation et réalisation  
d'une émission d'information en studio.  
Utilisation des caméras, contrôle du son et  
de l'image. Technique du montage magnétoscopique.

TECHNIQUE DE RADIO-TELEVISION 2

Télévision. Réalisation d'un reportage filmé.  
Cueillette de l'information - interview - commen-  
taire - assemblage. Utilisation des magnétoscopes  
portatifs montage.

TECHNIQUE DE RADIO-TELEVISION 3

Télévision. Couverture d'un événement.



## TECHNIQUE DE RADIO-TELEVISION 4

Radio. Utilisation du magnétophone: les techniques du mixage, contrôle du son, console. Production des bandes magnétophoniques. Montage musique-texte. La bande AM et FM.

## TECHNIQUE DE RADIO-TELEVISION 5

Radio. Le fonctionnement d'un poste radiophonique: discothèque, son animation, réalisation, direction des programmes.

## TECHNIQUE DE RADIO-TELEVISION 6 (Techniques orientées)

Audio-visuel. Fabrication d'un document d'information (éducation et diffusion de la recherche.) Structuration du message selon les media employés, fabrication des unités, unités de base et satellites, intégration au message global des divers niveaux de message. Réalisation

## TECHNIQUE DE RADIO-TELEVISION (Techniques orientées)

Information-animation de groupe (congrès, colloques). Production de documents d'information (bandes magnétoscopiques), formation d'ateliers de discussion. Planification générale des ateliers de travail et des plénières.

(2) Administration

ADMA 332 - Gestion de l'information

(3) Education

PED 201 - Pédagogie de la communication

(4) Génie Electrique

PHYS 320 - Physique des ondes I  
PHYS 420 - Physique des ondes II  
PHYS 520 - Micro-ondes et plasma I  
PHYS 620 - Micro-ondes et plasma II

(5) Science d'ordinateur

MATH 104 - Informatique I  
MATH 204 - Informatique II  
MATH 214 - Informatique V  
MATH 224 - Informatique VI  
MATH 304 - Informatique III  
MATH 504 - Informatique IV

Université du Québec  
Rimouski, P.Q.

(1) Communications

Aucun

(2) Administration

Aucun

(3) Education

Aucun

(4) Génie Electrique

PHY 226 70 - Théorie des ondes

(5) Science d'ordinateur

Aucun

Université du Québec  
Trois-Rivières, P.Q.

(1) Communications

- 534-931 - Psychologie de la communication I
- 534-941 - Psychologie de la communication II
- 599-841 - Cinéma: notion de continuité et de découpage
- 599-851 - Cinéma français 1895-1930
- 599-861 - Cinéma III
- 599-871 - Cinéma IV

(2) Administration

- 131-611 - Communication I: publicité & promotion
- 131-621 - Communication II: vente & distribution
- 151-141 - Communication & administration I
- 514-611 - Communications & promotion
- 777-531 - Information & gestion
- 778-121 - Management information systèmes

(3) Education

Aucun

(4) Génie Electrique

- 747-611 - Physique des ondes
- 759-421 - Systèmes de communication
- 759-621 - Transmission de l'énergie II
- 759-631 - Ondes électro magnétiques, antennes

(5) Science d'ordinateur

- 736-611 - Programmation I
- 736-621 - Programmation II
- 736-671 - Informatique & cobol
- 737-611 - Programmation 0

Université du Québec  
Varennés, P.Q.

INSTITUT NATIONAL  
DE LA RECHERCHE  
SCIENTIFIQUE Centre  
de recherche de l'é-  
nergie (Varennés)

Ce centre offre un programme de maîtrise et de doctorat en énergie et ses domaines de spécialisation sont la physique des plasmas, les mathématiques appliquées, la conversion et la génération de l'énergie, les matériaux, le contrôle des grandes énergies et la transmission de l'énergie électrique.

Queen's University  
Kingston, Ont.

(1) Communications

Film 020 - Introduction (U)  
Film 310 - Fundamentals of Film Production (U)  
Film 321 - American Cinema (U)  
Film 421 - European Cinema-Problems of Criticism (U)  
Political Science 423 - Political Communication (U)  
Political Science 823 - Political Functions of the Mass Media (G)  
Psychology 314 - Human Information Processing (U)  
Sociology 331 - Communications (U)

(2) Business Administration

Commerce 20-435 - Communication in Marketing (U)  
Commerce 20-314 - Information Systems & Accounting (U)

(3) Education

None

(4) Electrical Engineering

30.451 - Microwave Devices (G)  
30.461 - Communications Theory (G)  
30.482 - Electromagnetic Waves (G)  
30.862 - Statistical Communications Theory (G)  
30.863 - Optical Data Processing (G)  
30.864 - Signal Antennas Data Processing Antennas (G)  
30.865 - Coding Theory (G)  
30.866 - Information Theory (G)  
30.881 - Electromagnetic Radiation (G)  
30.885 - Guided magnetic Propagation I (G)  
30.886 - Guided Magnetic Propagation II (G)  
30.962 - Advanced Topics in Communication Theory (G)  
31.320 - Engineering Communication (U)  
31.322 - Engineering Communication (U)

(5) Computer Science

Computing & Info. Science 22-010 - Fundamentals (U)  
Computing & Info. Science 22-011 - Introduction (U)  
Computing & Info. Science 22-018 - Introduction for Numerical Computing I (U)  
Computing & Infor.Science 22-019 - Intorduction for Numerical Computing II (U)  
Computing & Info. Science 22-261 - Advanced Fortran Programming (U)  
Computing & Info. Science 22-281 - Computer Applications in the Arts & Sciences (U)  
Computing & Infor.Science 22-311 - Intro & Numerical Methods I (U)  
Computing & Info. Science 22-312 - Intro & Numerical Methods II (U)  
Computing & Info. Science 22-332 - Current Software Syst (U)  
Computing & Info. Science 22-342 - Current Hardware Syst (U)

(5) Computer Science(Cont'd).

Computing & Info. Science 22-345 - Intro. to Principles of Logical Design (U)  
 Computing & Info. Science 22-351 - Information Science & Library Organization (U)  
 Computing & Info. Science 22-361 - Principles of Programming & Assembler Coding I  
 Computing & Info. Science 22-363 - Computer Languages (U)  
 Computing & Info. Science 22- 82 - Computers in the Social Sciences (U)  
 Computing & Info. Science 22-384 - Data Processing & Cobol Programming (U)  
 Computing & Info. Science 22-392 - Systems Methodology (U)  
 Computing & Info. Science 22-411 - Advanced Numerical Analysis I (U)  
 Computing & Info. Science 22-412 - Advanced Numerical Methods II (U)  
 Computing & Info. Science 22-417 - Statistical Programming (U)  
 Computing & Info. Science 22-421 - Computational Linguistics I (U)  
 Computing & Info. Science 22-466 - Symbol Manipulation Languages (U)  
 Computing & Info. Science 22-491 - Information Structures I (G)  
 Computing & Info. Science 22-964 - Comparative Study of Programming Languages (G)  
 Computing & Info. Science 22-965 - Theory of Programming Languages (G)



Royal Military College of Canada  
Kingston, Ont.

(1) Communications

Social Psychology 304 - Social Interaction (U)  
(Dept. of Military Leadership & Mgt.)

(2) Business Administration

None

(3) Education

None

(4) Electrical Engineering

EE 439B- Communications  
EE 333B- Signal Analysis & Communication (U)  
EE 501 - Theory of Statistical Communications (G)  
EE 511 - Digital (G)  
EE 513 - State Space Methods for System Analysis (G)  
EE 515 - Nonlinear Control Systems (G)  
EE 523 - Passive Networks (G)  
EE 525 - Applied Electromagnetics (G)  
EE 531 - Hybrid Computation & Simulation (G)  
EE 533 - Advanced Radar Systems Methods (G)

(5) Computer Science

Electrical Engineering 379A - Analog & Digital Computer Programm  
Mathematics 311 - Elementary Computer Programming  
Mathematics 317 - Data Processing, Techniques & Numerical  
Mathematics 323B - Computer Techniques & Data Processing  
Mathematics 341A - Computer Programming & Numerical Methods

Saint Mary's University  
Halifax, N.S.

(1) Communications

None

(2) Business Administration

None

(3) Education

None

(4) Electrical Engineering

None

(5) Computer Science

None

University of Saskatchewan  
Regina, Sask.

(1) Communications

Communications 810 - The Process of Perceiving Reality (G)  
 Communications 820 - Techniques of Communication Anal. I (G)  
 Communications 821 - Techniques of Communication Anal. II (G)  
 Communications 830 - The Diversity of Languages (G)  
 Communications 840 - Philosophy of Communications (G)  
 Communications 841 - Arts of Communications (G)  
 Communications 901 - Research (G)  
 Economics 861 - Political Economy of Communications (G)  
 Economics 862 - Political Economy of Communications (G)  
 Political Science 803 - Political Parties & Interest Groups in Canada (G)  
 Political Science 804 - Political Parties & Interest Groups in Canada (G)  
 Political Science 824 - Comparative Political Systems (G)  
 Political Science 840 - Urban Politics (G)  
 Canadian Plains Area Studies 801 - Seminar (G)  
 Canadian Plains Area Studies 901 - Research (G)  
 Sociology 890 - Directed Readings (G)  
 Social Studies 890 - Directed Readings (G)  
 Art 200 - Methods & Media (U)  
 Art 215 - Intro to Film (U)  
 Art 216 - Development of Cinema, 1895-1929 (U)  
 Economics 381 - The Political Economy of Communications (U)  
 Economics 382 - The Political Economy of Communications (U)  
 Political Science 319 - Political Behavior (U)  
 Social Studies 211 - Critical Analyses of Film & Electronic (U)  
 Social Studies 212 - Critical Analyses of Film & Electronic (U)  
 Social Studies 313 - Film & Electronic Recording as Research Tools (U)  
 Social Studies 351 - Symbolic Basis of Behavior (U)  
 Social Studies 352 - Communication & Social Reality (U)

(2) Business Administration

Administration 370 - Management Information Systems & Systems Analysis (U)

(3) Education

None

(4) Electrical Engineering

Civil Eng. 811.3 - Urban Engineering (G)  
 Civil Eng. 812.2 - Regional Engineering (G)  
 Civil Eng. 813.2 - Interface Engineering (G)

(4) Electrical Engineering

Electrical Eng. 821.6 - Advanced Network Analysis (G)  
Electrical Eng. 822.4 - Network Synthesis (G)  
Electrical Eng. 831.3 - Control System Theory & Design (G)  
Electrical Eng. 833 - Sampled Data Control Systems (G)  
Mathematics 852.0 - Statistical Estimation Theory (G)  
Mathematics 859.0 - Topics in Probability & Statistics (G)  
Mathematics 869.3 - Topics in Numerical Analysis (G)

(5) Computer Science

Administration 231 - Introduction to Computers (U)  
Mathematics 879.0 - Topics in Computer Science (G)  
Mathematics 271 - Computer Science I (U)  
Mathematics 371 - Computer Science II (U)  
Mathematics 471 - Computer Science III (U)  
Mathematics 472 - Computer Science IV (U)

N.B.    Biology 805.0 - Current Problems in Applied Ecology (G)  
          Biology 863.9 - Population Dynamics (G)  
          Biology 865.7 - Behavioral Ecology (G)

University of Saskatchewan  
Saskatoon, Sask.

(1) Communications

Art 202 - History of Photography & the Film (U)

(2) Business Administration

Management 407 - Business Communications (U)

(3) Education

Education 472A&D - Communication & Audiovisual Education (U)

Education Technology 272 - Communication: Processes, Media & Problems (U)

(4) Electrical Engineering

Electrical Engineering 444A - Information Transfer (U)

Electrical Engineering 488A - Communication Systems (U)

(5) Computer Science

Computing 177 - Introduction to Computers (U)

Computing 212B - Introduction to System Programming (U)

Computing 313B - Intermediate System Programming (U)

Computing 314A - Information Structures & Processing (U)

Computing 377A - Data Processing (U)

Computing 378A - Simulation Principles (U)

Computing 379B - Simulation Applications (U)

Computing 415A - Computer - Programming Languages (U)

Computing 416B - Compiler Construction (U)

Computing 417B - Heuristic Problem Solving & Modelling (U)

Computing 419A - Theoretical Concepts in Computing Science

Computing 420A - Principles of Logic Systems (U)

Computing 421B - Introduction to Sequential Machines (U)

Computing 476B - Real-Time Information Systems (U)

Electrical Engineering 484B - Digital Computer Circuits & Systems (U)

Université de Sherbrooke  
Sherbrooke, P.Q.

(1) Communications

- Economie 1243 - Informatique (S)  
Service Social 3733 - Séminaire sur les théories, les processus  
et les techniques de la communication (S)  
Service Social 6111 - Stratégie d'action, information et modèles  
prédictifs (G)  
  
PSY 2172 - Langage et fonctions symboliques  
PSY 2953 - Séminaire sur l'opinion publique

(2) Administration

- ADM 1103 - L'individu et le groupe (relations interpersonnelles)  
ADM 3303 - Sociologie de l'administration  
MAR 2103 - Théorie de la communication

(3) Education

- ISP 3706 - Psychologie des communications

(4) Génie électrique

- ELE 3901 - Communication orale et écrite  
ELE 4505 - Systèmes de communications  
ELE 4515 - Circuits de communications  
ELE 6524 - Théorie des systèmes de communications digitales  
ELE 6554 - Théorie de l'information et codage  
ELE 6714 - Systèmes de commande aux données échantillonnées

(5) Science d'ordinateur

- MAT 1083 - Eléments d'informatique  
MAT 3593 - Théorie de l'information

Simon Fraser University  
Burnaby, B.C.

(1) Communications

Communications 100 - Explorations in Communication (U)  
Communications 200 - Theory & Process of Communication (U)  
Communications 300 - Learning & Creativity (U)  
Communications 400 - Dynamics of Communication and Innovation (U)  
Communications 498 - Individual Study Semester (U)  
BSF 827 - The Creative Process (G)  
BSF 828 - The Process of Communication (G)  
Geography 425 - Geography of Communications (U)

(2) Business Administration

Business 370 - Business Management (U)

(3) Education

None

(4) Electrical Engineering

None

(5) Computer Science

Mathematics 106 - Introduction to Computing (U)  
Mathematics 205 - Computer & Programming (U)



Sir George Williams University  
Montréal, P.Q.

(1) Communications

- Instructional Communication 601 - Studies in the Foundations of the history & development of Instructional Communications
- Instructional Communication 602 - Studies in Communication Theory (Educational Cybernetics)
- Instructional Communication 603 - Theory of the Moving Age (Film & TV Theory)
- Instructional Communication 604 - Studies in Development & Management (Administration of Media Programs for Educational Institutions)
- Instructional Communication 605 - Studies in Applied Systems Theory (Computer Based Systems)
- Instructional Communication 606 - Studies in Applied Art for Instruction Communication (Graphics)
- Instructional Communication 607 - Special Issues in Instructional Communication
- Instructional Communication 610 - Seminar on Research & Writing for Media (Scriptwriting for TV & Radio)
- Instructional Communication 611 - Laboratory in TV Production & Evaluation for Education
- Instructional Communication 613 - Laboratory in Motion Picture Production and Evaluation
- Instructional Communication 614 - Laboratory in Instructional Communications
- Instructional Communication 615 - Laboratory in Animation & Computer Graphics (Film Animation)
- Instructional Communication 616 - TV Workshop
- Instructional Communication 620 - Field Study in Instructional Communications
- Instructional Communication 690 - Thesis Equivalent

(2) Business Education

None

(3) Education

Education 604 - Seminar & Workshop in Human Communication

(4) Electrical Engineering

- EE 600 - Statistical Theory of Communications
- EE 720 - Topics in Microelectronics
- EE 723 - Materials Technology
- EE 724 - Device Technology
- EE 800 - Modern Development in Networks & Systems
- EE 761 - Wave Propagation

Sir George Williams University - 2 -(5) Computer Science

- Computer Science 211 - Intro. to Computers & Computing  
212 - Computer Programming 11  
410 - Advanced Computer Programming  
411 - Principles of Data Processing  
420 - Intro. to Automata Theory and Theory  
of computation  
430 - Logical Design and Switching Theory  
471 - **Digital** Computer Programming & Numerical  
Methods
- Eng 611 - Stochastic Processes in Systems  
620 - Analog & Hybrid Simulation  
660 - Computer Organization  
742 - Industrial Process Control & Computer  
Applications  
761 - Computer Operating Systems

University of Toronto  
Toronto, Ont.

(1) Communications

Communications 1341X - Philosophical Study of Media in Education  
Anthropology 1111 - Problems in the Analysis of Communication Systems  
Culture & Technology 1000 - Media & Society  
Psychology 3375 - Communication & Cognition

(2) Business Administration

Business Administration 2502X - Mass Communications in Marketing  
Business Administration 2503X - Personal Communications in Marketing  
Business Administration 2703X - Technology of Management Information Systems  
Business Administration 2704X - Selected Topics in Management Information Systems  
Business Administration 1072X - Business Information Systems  
Urban & Regional Planning 1035X - Urban Data Systems & Analysis

(3) Education

Education 1341X - Philosophical Study of Media in Education  
Education 455.06 - Educational Media  
Education 455.22 - The Language Arts of the Cinema  
Education 1123X - Seminar: Educational Applications of Psychology of Communications

(4) Electrical Engineering

EE 761 - Information Processing Systems I (U)  
EE 798 - Information Processing Systems II (U)  
EE 770 - Communication Systems (U)  
EE 782 - Information Systems I (U)  
EE 786 - Information Systems II (U)  
EE 1501X - Nonlinear Network Theory (G)  
EE 1502 - Signal Theory & Processing (G)  
EE 1504X - Statistical Communication Theory (G)  
EE 1506X - Information Theory (G)  
EE 1507X - Linear Network Analysis & Synthesis I (G)  
EE 1508X - Linear Network Analysis & Synthesis II (G)

(5) Computer Science

Engineering 135 - Mathematical Applications & Computer Programming (U)  
Engineering 145 - Computer (U)  
Engineering 422 - Computers & Programming I (U)  
Engineering 423 - Computers & Programming II (U)

(5) Computer Science (Cont'd)

Engineering 425 - Man as an Information Processor (U)  
Engineering 430 - Information & Optimization (U)  
Computer Science 3310S - Introduction to Computer Programming (U)  
Computer Science 3320 - Computer Languages (U)  
Computer Science 3338S - Programming & Data Structures (U)  
Computer Science 3339 - Systems & Programming Languages  
Computer Science 3341S - Computer Organization (U)  
Computer Science 3342S - Theory of Computability (U)  
Computer Science 3343S - Automata Theory (U)  
Computer Science 3344S - Operating Systems (U)  
Computer Science 1101 - Computer Programming & Applications (G)  
Computer Science 1102 - Computer Programming of Statistical Applications (G)  
Computer Science 1103X - Computer Programming in the Humanities (G)  
Computer Science 1104X - Machine & Assembly Languages (G)  
Computer Science 1301 - Numerical Analysis for Scientists & Engineers I (G)  
Computer Science 1302 - Numerical Analysis for Scientists & Engineers II (G)  
Computer Science 2101 - Languages for Computer Programming (G)  
Computer Science 2102 - Languages for Symbol Manipulation (G)  
Computer Science 2122 - Languages for Systems Programming (G)  
Computer Science 2221 - Computer Systems Practice (G)  
Computer Science 2222X - Computer Systems Engineering (G)  
Computer Science 2223X - Special Topics in Computer Design (G)  
Computer Science 2401 - Logic, Computability & Automata Theory (G)  
Computer Science 2402 - Combinatorial Theory (G)  
Computer Science 2403 - Information Theory (G)  
Computer Science 2421X - Sequential Machines (G)  
Computer Science 2422X - Abstract & Iterative Arrays (G)  
Computer Science 2423X - The Theory of Formal Languages (G)  
Computer Science 2424X - Theory of Computation (G)  
Computer Science 2425 - Recursive Function Theory (G)  
Computer Science 2426X - Topics in Networks & Combinations (G)  
Computer Science 2427X - Topics in Graph Theory & Combinations (G)  
Computer Science 2501X - Computational Linguistics (G)  
Computer Science 2502 - Data Processing (G)  
Computer Science 2521 - Graphic Information Processing (G)  
Computer Science 2522X - Artificial Intelligence (G)  
Computer Science 2523X - Pattern Recognition (G)  
Electrical Engineering 1707X - Sequential Machines (G)  
Electrical Engineering 1708X - Computer System Engineering (G)  
Electrical Engineering 1710X - Digital Circuit Design (G)  
Electrical Engineering 1712 - Computer Systems Practice (G)  
Electrical Engineering 1715X - Non-Boolean Switching Systems  
Electrical Engineering 1716X - Abstract Machines & Formal Language (G)  
Electrical Engineering 1717X - Software Technology (G)  
Electrical Engineering 1718X - Special Topics in Computer Hardware Design (G)  
Electrical Engineering 1719X - Analogue & Digital Instrumentation (G)

Trent University  
Trent, Ont.

(1) Communications

Psychology 24 - Sociology 33 - Social Psychology

(2) Business Administration

None

(3) Education

None

(4) Electrical Engineering

None

(5) Computer Science

None



University of Victoria  
Victoria, B.C.

(1) Communications

Sociology 355 - Sociology of Communication (U)  
Psychology 331 - Social Psychology (U)

(2) Business Administration

None

(3) Education

Education 300 - Seminar in Human Communication & Interaction (U)

(4) Electrical Engineering

None

(5) Computer Science

Mathematics 170 - Introduction to Computing (U)  
Mathematics 171 - Computer Applications (U)  
Mathematics 271 - Computer Fundamentals (U)  
Mathematics 272 - Computer Programming (U)  
Mathematics 370 - Computer Languages (U)  
Mathematics 371 - Systems Languages (U)  
Mathematics 470 - Computing Science Seminar (U)  
Mathematics 471 - Compiler Construction (U)  
Mathematics 472 - Theory of Computability (U)  
Mathematics 571 - Topics in Computing Science (G)

University of Waterloo  
Waterloo, Ont.

(1) Communications

Film 100 - History of Film

Film 110 - Film Forms

Political Science 594 - The Communications Media

Sociology 200 - Communication

(2) Business Administration

None

(3) Education

None

(4) Electrical Engineering

None

(5) Computer Science

None



Waterloo Lutheran University  
Waterloo, Ont.

(1) Communications

None

(2) Business Administration

Business Administration 471-30 - Advertising (U)

(3) Education

None

(4) Electrical Engineering

None

(5) Computer Science

Applied Mathematics 236-44 - Applied Mathematics I (U)

Applied Mathematics 336-44 - Applied Mathematics II (U)

University of Western Ontario  
London, Ont.

(1) Communications

Sociology 41 - Communications and Social Character (U)  
 Sociology 542 - Communication (U)  
 Journalism 20 - Intro. to Journalism (U)  
 Journalism 21 - Survey of Mass Communication (U)  
 Journalism 250- News Writing & Reporting (U)  
 Journalism 255- History of Journalism (U)  
 Journalism 260- Law for Journalists (U)  
 Journalism 350- Interpretative News Writing & Reporting (U)  
 Journalism 351- Newspaper Production (U)  
 Journalism 356- Radio News Writing & Reporting (U)  
 Journalism 375- Feature & Magazine Article Writing, Magazine Editing (U)  
 Journalism 400- Newswriting & Reporting (U)  
 Journalism 451- Communication Problems (U)  
 Journalism 455- Radio Documentaries, TV News & Documentaries (U)  
 Library Science 550 - Communication Studies (G)  
 Library Science 551 - Linguistic Studies (G)

(2) Business Administration

Business 471 - Marketing Communication (U)

(3) Education

None

(4) Electrical Engineering

EE Science 435b - Communication Theory (U)

(5) Computer Science

Library Science 552 - Intro. to Problems in the Computer Control  
 of Information (G)  
 Library Science 553 - Problems in the Computer Control of Information (G)  
 Library Science 558 - Topics in the Computer Control of Information (G)  
 Business 496 - Computers & Information Systems (U)  
 Computer Science 20 - Introduction I (U)  
 Computer Science 30 - Introduction II (U)  
 Computer Science 31 - Elements of Information Processing (U)  
 Computer Science 34 - Digital Computer Programming (U)  
 Computer Science 41 - Advanced Information Processing (U)  
 Computer Science 42 - Scientific Applications of Digital Computer (U)  
 Computer Science 43 - Computer Logic & Programming (U)  
 Computer Science 200 - Digital Computer Programming (U)

(5) Computer Science (Cont'd)

Computer Science 206 - Computational Mathematics (U)  
Computer Science 304 - Advanced Operation Systems (U)  
Computer Science 313 - Computer Logic & Design (U)  
Computer Science 403 - Intro. to Computing Algorithm (U)  
Computer Science 404 - Theory of General Systems (U)  
Computer Science 405 - Simulation Laboratory (U)  
Computer Science 413 - Non-Numeric Computing (U)  
Computer Science 501 - Information Structures (G)  
Computer Science 502 - Topics in Numerical Computation (G)  
Computer Science 503 - Theory of Approximation (G)  
Computer Science 504 - Topics in General Systems (G)  
Computer Science 505 - Computer Stimulation of Complex Process (G)  
Computer Science 506 - Topics in Statistics & Information Processing (G)  
Computer Science 507 - Theory of Communication (G)  
Computer Science 508 - Theorem Proving & Heuristic Problem Solving (G)  
Computer Science 512 - Sequential Machine Theory (G)  
Computer Science 513 - Theory of Recursive Functions & Computability (G)  
Computer Science 514 - Advanced Programming Systems (G)  
Computer Science 523 - Theory of Formal Languages & Automata (G)  
Computer Science 590 - Thesis (G)

University of Windsor  
Windsor, Ont.

### (1) Communications

Communications Arts 100 - Survey of Mass Media (U)  
Communications Arts 210 - Language of Film Modes of Film Communication (U)  
Communications Arts 215 - Production Processes in Radio & TV (U)  
Communications Arts 220 - Content Planning Processes in Print and  
Broadcast Media (U)  
Communications Arts 225 - Mass Communications Media in Education (U)  
Communications Arts 240 - History of Cinematic Act (U)  
Communications Arts 320 - Communication & Written Messages (U)  
Communications Arts 330 - Materials & Background of Mass Media Criticism (U)  
Communications Arts 335 - Methods of Mass Communication Analysis (U)  
Communications Arts 340 - Contemporary Cinema (U)  
Communications Arts 345 - Mass Media & Entertainment - The Popular Arts (U)  
Geography 32b - Transportation & Communication (U)  
Psychology 592 a & b - Psychology of Communications Processes (G)

(2) Business Administration

Business - 434C - Advertising (U)

### (3) Education

None

(4) Electrical Engineering

EE 409b - Communications (U)  
EE 582C - Statistical Theory of Communications (G)  
EE 583C - Introduction to Information Theory (G)

(5) Computer Science

Electrical Engineering	320a	- Fundamentals of Digital Computers (U)
Electrical Engineering	320b	- Assembly Language Programming (U)
Electrical Engineering	321b	- Scientific Computing (U)
Electrical Engineering	415	- Computer Systems Engineering (U)
Electrical Engineering	420	- Advanced Programming (U)
Electrical Engineering	422a	- System Theory (U)
Electrical Engineering	430a	- Computer Design (U)
Electrical Engineering	431	- Constructive Logic & Automata (U)
Computer Science	410b	- Computer & Programming Systems (U)

(5) Computer Science (Cont'd)

Business Administration 320a - Computing Methods & Processes (U)  
Business Administration 320b - Business Systems (U)  
Business Administration 325c - Computers & Systems Analysis (U)  
Business Administration 507 - Computers & System Analysis  
Electrical Engineering 550 - Computer Languages (G)  
Electrical Engineering 551c - Computer Software (G)  
Electrical Engineering 552c - Computer Design (G)  
Electrical Engineering 554c - Computer aided Design (G)  
Electrical Engineering 555c - Real Time Computer Systems

University of Winnipeg  
Winnipeg, Man.

(1) Communications

Political Science 3425 - Public Opinion, Parties & Pressure Groups (U)

(2) Business Administration

None

(3) Education

None

(4) Electrical Engineering

None

(5) Computer Science

None

York University  
Downsview, Ont..

(1) Communications

Political Science 301 - Political Behavior  
Sociology 346 - Mass Communications & Public Opinion  
Social Science 178 - Topics in Communication  
Fine Arts 101 - Film: the 20th Century Art (U)  
Fine Arts 211 - History of Film in North America (U)  
Fine Arts 212 - History of Film in Western Europe (U)  
Fine Arts 311 - History of Film in Eastern Europe & Asia (U)  
Fine Arts 312 - The Narrative Art of Film (U)  
Fine Arts 313 - The Documentary Film (U)  
Fine Arts 411 - Seminar in History & Criticism of the Film (U)  
Fine Arts 201 - Project I (Film) (U)  
Fine Arts 301 - Project II (Film) (U)  
Fine Arts 302 - Film Workshop (U)  
Fine Arts 401 - Project III (Film) (U)

(2) Business Administration

Administration 662 - Market Research & Communication

(3) Education

None

(4) Electrical Engineering

None

(5) Computer Science

Administration 636 - Computer & Information Systems I & II  
York - Arts  
AS 185 Computers and the Modern World  
AS 201 Applied Algebra and Comp. Programming  
AS 305 Algorithms in Complex Analysis  
AS 310 Elementary Computer Sc.  
AS 311 Introductory Comp. Sc.  
AS 312 Intermediate Comp. Sc.  
AS 315 Algorithms in Algebra  
AS 319 Comp. Systems  
AS 344 Numerical Methods  
AS 410 Data Processing  
AS 411 Advanced Computer Science  
AS 419 Computer Languages, Compilers, and List Processors  
AS 422 Selected Topics in Computer Science  
AS 424 Numerical Analysis





COMMUNICATIONS DISSERTATIONS

The following are some of the Masters or Doctorat dissertations mentioned by respondents. Titles presented are to provide an indication of the scope of communications topics. This is not meant to be an exhaustive list of topics.

(a) Science and Engineering

- "The use of computers by the air transport industry"
- "The Development and Design of an Audio-Amplifier System Controlled by Acoustical Background Noise"
- "Design of a Servomechanism for Use in Taking Microwave Antenna Pattern Measurements"
- "Application of the Reaction Concept to the Problem of Determining Mutual Impedance between a Pair of Coupled Dipole Antennas"
- "Theory of Economic Voltage Improvement for a Rural Distribution System"
- "Time-Varying Transmission Lines with Application to Radiometry.
- "The Resolution Capability of Radar Signals with Random Parameters"
- "Computer Simulation and Optimum Adaptive Threshold Receiver for Sporadic Recurrent Signals in Noise"
- "Modelling of a system of communities in the Canadian Artic".

(b) Social Sciences and Humanities - Professions

- "The relationship of sequential part presentation of form with higher cognitive processes"
- "Perceptual independence - descendance on the localization of identification of items in a two-dimensional space"
- "Optional Control of the Telecommunications Industry in Canada"
- "The Self Consuming Consumer Society"
- "Self Fulfilling Proficiencies"
- "Effectiveness of a Television Short Course for Farmers"
- "Analysis of the Effects of three Television Programs on Selected Farm Audiences"
- "The use of Information Sources by Perth Co. Dairy Farmers"
- "Some effects of a Programmed Orientation on Leaving Outcomes in a Human Relations Laboratory"









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